



United States  
Department of  
Agriculture

Natural Resources  
Conservation  
Service

In cooperation with the  
Montana Agricultural  
Experiment Station

# Soil Survey of Toole County, Montana

## Part I







# How to Use This Soil Survey

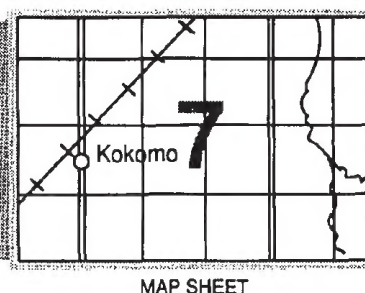
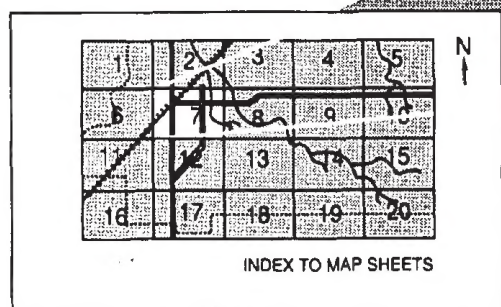
This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

## Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

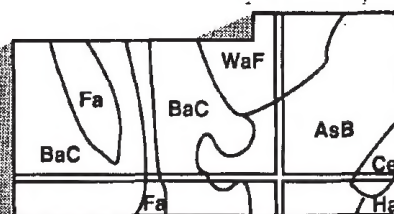
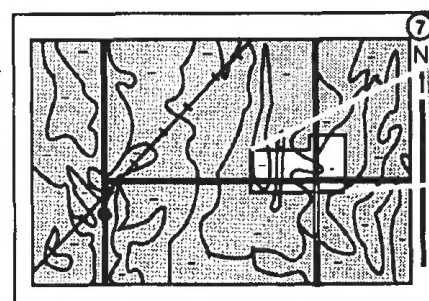
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.



The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

A **State Soil Geographic Data Base (STATSGO)** is available for this survey area. This



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

data base consists of a soils map at a scale of 1:250,000 along with groups of associated soils. It replaces the general soils map published in older surveys. This map and its data base can be useful for planning multi-county areas and map output can be tailored for specific use. For more information about the State Soil Geographic Data Base for this survey area, or for any portion of Montana, contact your local Natural Resources Conservation Service office.

---

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Toole County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

**Cover: Typical area of strip cropping on Telstad-Joplin loams, 0 to 4 percent slopes.**

*Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is <http://www.nrcs.usda.gov> (click on "Technical Resources").*

# Contents

---

## Part I

<b>Index to Series</b> .....	6
<b>Index to Soil Map Units</b> .....	8
<b>Summary of Tables</b> .....	13
<b>Foreword</b> .....	15
How This Survey Was Made .....	17
General Nature of the Survey Area .....	18
History, Settlement, and Farming .....	18
Markets and Transportation .....	19
Physiography, Relief, and Drainage .....	19
Natural Resources .....	19
Geology and Geomorphology .....	20
Climate .....	22
<b>Formation and Classification</b> .....	29
Formation of the Soils .....	29
Classification of the Soils .....	30
<b>Soil Series and Detailed Soil Map Units</b> .....	39
<b>References</b> .....	185
<b>Glossary</b> .....	187

## Part II

<b>Detailed Soil Map Unit Legend</b> .....	6
<b>Summary of Tables</b> .....	10
<b>Agronomy</b> .....	21
Cropland Limitations and Hazards .....	21
Crop Yield Estimates .....	22
Crops and Pasture of Toole County .....	23
Land Capability Classification .....	25
Prime Farmland and Other Important Farmland .....	25

Erosion Factors .....	27
Windbreaks and Environmental Plantings .....	27
<b>Range</b> .....	83
Range Condition .....	84
Rangeland Management .....	84
Forest Land Understory Vegetation .....	85
<b>Forest Land</b> .....	121
Woodland Ordination System .....	121
Forest Land Management and Productivity .....	122
Forest Land Management and Productivity for Toole County .....	123
<b>Recreation</b> .....	129
<b>Wildlife Habitat</b> .....	153
Elements of Wildlife Habitat .....	153
Kinds of Wildlife Habitat .....	153
Wildlife Habitat in Toole County .....	154
<b>Engineering</b> .....	155
Building Site Development .....	155
Sanitary Facilities .....	156
Waste Management .....	157
Construction Materials .....	158
Water Management .....	159
<b>Soil Properties</b> .....	247
Engineering Index Properties .....	247
Physical and Chemical Properties .....	248
Water Features .....	250
Soil Features .....	251
<b>References</b> .....	377
<b>Glossary</b> .....	379



## Index to Series

---

Absher series .....	40	Kevin series .....	107
Acel series .....	42	Kiwanis series .....	110
Assinniboine series .....	43	Kobase series .....	111
Attewan series .....	44	Korchea series .....	113
Bascovy series .....	46	Kremlin series .....	114
Bearpaw series .....	47	Lambeth series .....	115
Benz series .....	49	Lihen series .....	116
Bigsag series .....	50	Lonna series .....	117
Bigsandy series .....	51	Macar series .....	119
Blanchard series .....	52	Marias series .....	121
Brockway series .....	53	Marmarth series .....	122
Busby series .....	54	Marvan series .....	124
Cabba series .....	56	McKenzie series .....	125
Cabbart series .....	58	Meadowcreek series .....	127
Chinook series .....	61	Neldore series .....	128
Cozberg series .....	63	Nesda series .....	130
Creed series .....	65	Nishon series .....	131
Daglum series .....	66	Nobe series .....	133
Dast series .....	67	Nunemaker series .....	134
Degrad series .....	68	Perma series .....	135
Delpoint series .....	70	Phillips series .....	137
Doney series .....	71	Reeder series .....	140
Elloam series .....	72	Rivra series .....	142
Enbar series .....	74	Roy series .....	143
Ethridge series .....	76	Ryell series .....	144
Evanston series .....	77	Sagedale series .....	145
Fairway series .....	81	Savage series .....	146
Farnuf series .....	82	Scobey series .....	147
Ferd series .....	84	Shambo series .....	150
Fleak series .....	86	Stemple series .....	151
Floweree series .....	87	Sunburst series .....	153
Gerber series .....	89	Tally series .....	155
Gerdrum series .....	90	Tanna series .....	156
Glendive series .....	91	Telstad series .....	157
Hanly series .....	92	Tinsley series .....	161
Harlake series .....	93	Trudau series .....	162
Havre series .....	94	Turner series .....	163
Hedstrom series .....	96	Vaeda series .....	164
Hillon series .....	97	Vanda series .....	165
Joplin series .....	101	Vida series .....	169
Kenilworth series .....	105	Whitlash series .....	174



---

Williams series .....	175
Yamacall series .....	176
Yetull series .....	179

Zahill series .....	180
Zahl series .....	182

# Index to Soil Map Units

---

2A—Riverwash.....	142	35C—Assinniboine fine sandy loam, 4 to 8 percent slopes .....	44
4B—Brockway silt loam, 2 to 4 percent slopes ...	54	36C—Chinook loam, 0 to 8 percent slopes .....	62
4C—Brockway silt loam, 4 to 8 percent slopes ..	54	37B—Evanston clay loam, 0 to 4 percent slopes .....	78
12C—Tally sandy loam, 2 to 8 percent slopes .....	155	37C—Evanston clay loam, 4 to 8 percent slopes .....	79
12D—Tally sandy loam, 8 to 15 percent slopes .....	156	38B—Ethridge clay loam, 0 to 4 percent slopes .....	77
13B—Tanna clay loam, 0 to 4 percent slopes .....	157	39B—Ferd loam, 0 to 4 percent slopes .....	85
13C—Tanna clay loam, 4 to 8 percent slopes .....	157	42B—Joplin clay loam, 0 to 4 percent slopes ...	102
14A—McKenzie silty clay, 0 to 1 percent slopes .....	126	42C—Joplin clay loam, 4 to 8 percent slopes ...	102
15F—Lambeth silt loam, 15 to 70 percent slopes .....	116	44B—Kevin clay loam, 0 to 4 percent slopes ...	108
16B—Degrand loam, 0 to 4 percent slopes .....	69	44C—Kevin clay loam, 4 to 8 percent slopes ...	108
19B—Kenilworth loam, 0 to 4 percent slopes ...	106	45C—Cozberg fine sandy loam, 2 to 8 percent slopes .....	63
20C—Cabba loam, 4 to 8 percent slopes .....	57	45D—Cozberg fine sandy loam, 8 to 15 percent slopes .....	64
20D—Cabba loam, 8 to 15 percent slopes .....	57	47B—Marias silty clay, 0 to 4 percent slopes ...	122
22E—Hillon clay loam, 8 to 25 percent slopes ...	98	48B—Vanda silty clay, 0 to 4 percent slopes ....	166
22F—Hillon clay loam, 25 to 60 percent slopes .....	98	48C—Vanda silty clay, 4 to 8 percent slopes ....	167
23A—Acel silty clay loam, 0 to 2 percent slopes .....	43	49C—Floweree silt loam, 2 to 8 percent slopes .....	88
26B—Absher clay, 0 to 4 percent slopes .....	41	50B—Telstad clay loam, 0 to 4 percent slopes .....	158
27B—Attewan loam, 0 to 4 percent slopes .....	45	51B—Turner loam, 0 to 4 percent slopes .....	164
28A—Nishon clay loam, 0 to 1 percent slopes .	132	53D—Sunburst clay loam, 8 to 15 percent slopes .....	154
29B—Nunemaker silty clay loam, 0 to 4 percent slopes .....	135	53E—Sunburst clay loam, 15 to 25 percent slopes .....	154
29C—Nunemaker silty clay loam, 4 to 8 percent slopes .....	135	53F—Sunburst clay loam, 25 to 70 percent slopes .....	154
30B—Marvan silty clay, 0 to 4 percent slopes .....	125	54B—Trudau loam, 0 to 4 percent slopes .....	163
30C—Marvan silty clay, 4 to 8 percent slopes .....	125	58B—Lonna silt loam, 0 to 4 percent slopes ....	118
32B—Kobase silty clay loam, 0 to 4 percent slopes .....	112	59B—Hedstrom fine sandy loam, 0 to 4 percent slopes .....	97
32C—Kobase silty clay loam, 4 to 8 percent slopes .....	112	60A—Havre silty clay loam, 0 to 2 percent slopes .....	95
33B—Phillips clay loam, 0 to 4 percent slopes .....	139	62A—Vaeda silty clay loam, 0 to 2 percent slopes .....	165
35B—Assinniboine fine sandy loam, 0 to 4 percent slopes .....	44	64B—Nobe clay, 0 to 4 percent slopes .....	134
		67B—Bearpaw clay loam, 0 to 4 percent slopes .....	48

68B—Gerber clay, 0 to 4 percent slopes .....	89	141A—McKenzie clay, saline, 0 to 2 percent slopes .....	126
69A—Vida clay loam, 0 to 2 percent slopes .....	169	143A—Meadowcreek loam, 0 to 2 percent slopes .....	127
69C—Vida clay loam, 2 to 8 percent slopes .....	170	144A—Bigsandy silty clay loam, 0 to 1 percent slopes .....	52
71F—Roy gravelly clay loam, 25 to 60 percent slopes .....	143	162B—Degrand sandy loam, 0 to 4 percent slopes .....	69
72F—Zahill loam, 25 to 45 percent slopes .....	180	171F—Delpoint-Cabbart clay loams, 25 to 60 percent slopes .....	71
73D—Yetull loamy fine sand, 0 to 15 percent slopes .....	180	181D—Doney-Cabba complex, 4 to 15 percent slopes .....	72
74B—Shambo loam, 0 to 4 percent slopes .....	151	191B—Kenilworth fine sandy loam, 0 to 4 percent slopes .....	106
75B—Farnuf clay loam, 0 to 3 percent slopes ....	83	200F—Badland .....	46
75C—Farnuf clay loam, 3 to 8 percent slopes ....	84	201F—Cabba-Rock outcrop complex, 25 to 70 percent slopes .....	58
77C—Tinsley gravelly sandy loam, 2 to 8 percent slopes .....	161	202F—Cabba-Dast fine sandy loams, 25 to 45 percent slopes .....	57
77E—Tinsley gravelly sandy loam, 8 to 25 percent slopes .....	161	203E—Cabba-Doney clay loams, 8 to 25 percent slopes .....	58
79B—Yamacall loam, 0 to 4 percent slopes .....	177	211F—Cabbart-Rock outcrop complex, 25 to 70 percent slopes .....	60
79C—Yamacall loam, 4 to 8 percent slopes .....	178	212F—Cabbart-Hillon complex, 25 to 45 percent slopes .....	60
79D—Yamacall loam, 8 to 15 percent slopes .....	178	213E—Cabbart-Delpoint loams, 8 to 25 percent slopes .....	60
80B—Williams clay loam, 0 to 3 percent slopes .....	176	221E—Hillon-Kevin clay loams, 15 to 25 percent slopes .....	100
80C—Williams clay loam, 3 to 8 percent slopes .....	176	222E—Hillon-Neldore complex, 8 to 25 percent slopes .....	100
82B—Savage silty clay loam, 0 to 3 percent slopes .....	147	222F—Hillon-Neldore complex, 25 to 70 percent slopes .....	100
85B—Benz clay loam, 0 to 4 percent slopes .....	50	224E—Hillon-Joplin loams, 8 to 25 percent slopes .....	99
88C—Perma gravelly loam, 2 to 8 percent slopes .....	136	241C—Marmarth-Evanston loams, 0 to 8 percent slopes .....	123
88E—Perma gravelly loam, 8 to 25 percent slopes .....	136	251C—Bascovy clay loam, 2 to 8 percent slopes .....	47
90A—Harlake silty clay loam, 0 to 2 percent slopes .....	94	252D—Bascovy-Neldore clays, 8 to 15 percent slopes .....	47
94C—Busby fine sandy loam, 2 to 8 percent slopes .....	55	261A—Absher-Nobe complex, 0 to 2 percent slopes .....	41
94D—Busby fine sandy loam, 8 to 15 percent slopes .....	55		
96C—Macar loam, 4 to 8 percent slopes .....	121		
96D—Macar loam, 8 to 15 percent slopes .....	121		
98B—Kremlin loam, 0 to 4 percent slopes .....	115		
101A—Hanly-Glendive-Havre complex, 0 to 2 percent slopes .....	93		
110A—Korchea-Kiwanis complex, 0 to 2 percent slopes .....	114		

272B—Attewan sandy loam, 0 to 4 percent slopes .....	46	421D—Joplin-Hillon clay loams, 8 to 15 percent slopes .....	104
300F—Rubble land .....	144	423B—Joplin-Hillon clay loams, 0 to 3 percent slopes .....	103
311B—Creed-Gerdrum-Absher complex, 0 to 4 percent slopes .....	66	423C—Hillon-Joplin clay loams, 3 to 8 percent slopes .....	99
321B—Kobase silty clay loam, calcareous, 0 to 4 percent slopes .....	113	424C—Joplin-Hillon gravelly loams, 3 to 8 percent slopes .....	104
321C—Kobase silty clay loam, calcareous, 4 to 8 percent slopes .....	113	425C—Joplin-Telstad clay loams, 2 to 8 percent slopes .....	105
323C—Sagedale silty clay loam, 2 to 8 percent slopes .....	146	426B—Joplin loam, 0 to 4 percent slopes .....	103
331B—Phillips-Elloam clay loams, 0 to 4 percent slopes .....	139	427B—Joplin complex, 0 to 4 percent slopes .....	102
332B—Phillips-Kevin clay loams, 0 to 4 percent slopes .....	140	427C—Joplin complex, 4 to 8 percent slopes .....	103
364C—Chinook fine sandy loam, 0 to 8 percent slopes .....	62	441C—Kevin-Hillon clay loams, 2 to 8 percent slopes .....	110
372B—Evanston fine sandy loam, 0 to 4 percent slopes .....	79	443B—Kevin-Ferd complex, 0 to 4 percent slopes .....	110
373C—Evanston-Tinsley complex, 2 to 8 percent slopes .....	81	444B—Kevin, calcareous-Ferd complex, 0 to 4 percent slopes .....	109
374B—Evanston loam, 0 to 4 percent slopes .....	80	445B—Kevin complex, 0 to 4 percent slopes .....	108
374C—Evanston loam, 4 to 8 percent slopes .....	80	445C—Kevin complex, 4 to 8 percent slopes .....	108
378B—Evanston complex, 0 to 4 percent slopes .....	79	446C—Kevin-Elloam clay loams, 2 to 8 percent slopes .....	109
379C—Evanston-Busby complex, 2 to 8 percent slopes .....	80	451A—Cozberg-Lihen fine sandy loams, 0 to 2 percent slopes .....	64
384B—Ethridge silty clay loam, 0 to 4 percent slopes .....	77	451C—Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes .....	64
386B—Ethridge-Evanston clay loams, 0 to 4 percent slopes .....	77	481A—Bigsag silty clay, 0 to 2 percent slopes .....	51
391B—Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes .....	85	482A—Vanda-Marvan, saline, clays, 0 to 2 percent slopes .....	168
391C—Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes .....	86	503B—Telstad-Joplin clay loams, 0 to 4 percent slopes .....	159
402A—Gerdrum-Absher complex, 0 to 2 percent slopes .....	91	503C—Telstad-Joplin clay loams, 4 to 8 percent slopes .....	159
411B—Reeder-Cabba complex, 0 to 4 percent slopes .....	141	504B—Telstad-Joplin loams, 0 to 4 percent slopes .....	159
411C—Reeder-Cabba complex, 4 to 8 percent slopes .....	141	504C—Telstad-Joplin loams, 4 to 8 percent slopes .....	160
421C—Joplin-Hillon clay loams, 2 to 8 percent slopes .....	104	511C—Turner sandy loam, 2 to 6 percent slopes .....	164



521B—Elloam-Absher clay loams, 0 to 4 percent slopes .....	74	697C—Vida-Bearpaw clay loams, 2 to 8 percent slopes .....	170
551E—Lihen-Blanchard loamy sands, 8 to 25 percent slopes .....	117	698D—Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes .....	171
561B—Scobey-Kevin clay loams, 0 to 4 percent slopes .....	149	698E—Vida-Zahill-Nishon clay loams, 0 to 25 percent slopes .....	174
561C—Scobey-Kevin clay loams, 4 to 8 percent slopes .....	149	721E—Zahill-Zahl complex, 15 to 25 percent slopes .....	181
561D—Scobey-Kevin clay loams, 8 to 15 percent slopes .....	149	721F—Zahill-Zahl complex, 25 to 60 percent slopes .....	182
563B—Scobey clay loam, 0 to 4 percent slopes .....	148	722F—Zahill-Dast-Cabba complex, 25 to 65 percent slopes .....	181
571A—Ryell-Rivra complex, 0 to 2 percent slopes .....	145	743A—Shambo-Fairway loams, 0 to 2 percent slopes .....	151
572A—Ryell-Havre loams, 0 to 2 percent slopes .....	145	761B—Fairway-Bigsandy loams, 0 to 4 percent slopes .....	82
581B—Lonna silty clay loam, 0 to 4 percent slopes .....	118	793B—Yamacall loam, calcareous, 0 to 4 percent slopes .....	178
581C—Lonna silty clay loam, 4 to 8 percent slopes .....	119	793C—Yamacall loam, calcareous, 4 to 8 percent slopes .....	178
582B—Lonna-Ethridge complex, 0 to 4 percent slopes .....	119	793D—Yamacall loam, calcareous, 8 to 15 percent slopes .....	179
601A—Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded .....	96	831B—Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes .....	75
603A—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded .....	95	861F—Stemple, high elevation-Rubble land complex, 25 to 70 percent slopes .....	152
651E—Fleak-Lihen fine sandy loams, 8 to 25 percent slopes .....	87	862F—Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes .....	153
673B—Bearpaw-Daglun clay loams, 0 to 4 percent slopes .....	48	871B—Nesda complex, 0 to 4 percent slopes .....	131
691B—Vida-Vida, calcareous-Williams clay loams, 0 to 3 percent slopes .....	171	881E—Perma-Whitlash cobbly loams, 8 to 25 percent slopes .....	137
691C—Vida-Vida, calcareous-Williams clay loams, 3 to 8 percent slopes .....	172	881F—Perma-Whitlash cobbly loams, 25 to 70 percent slopes .....	137
692D—Vida, calcareous-Williams-Zahill clay loams, 4 to 15 percent slopes .....	170	942C—Busby-Chinook fine sandy loams, 2 to 8 percent slopes .....	55
694C—Vida-Williams clay loams, 3 to 8 percent slopes .....	172	961B—Macar clay loam, 0 to 4 percent slopes .....	120
695D—Vida-Williams-Zahill clay loams, 4 to 15 percent slopes .....	173	971C—Neldore-Bascovy clays, 2 to 8 percent slopes .....	128
696E—Vida-Zahill clay loams, 8 to 25 percent slopes .....	173	971F—Neldore-Bascovy clays, 8 to 45 percent slopes .....	129

---

972F—Neldore-Lambeth-Rock outcrop  
complex, 35 to 70 percent slopes ..... 130  
DA—Denied access ..... 71

M-W—Miscellaneous water ..... 128  
W—Water ..... 174

# Summary of Tables

---

## Part I

Temperature and precipitation -----	24
Freeze dates in spring and fall -----	26
Growing season -----	28
Classification of the soils -----	32
Acreage and proportionate extent of the soils -----	34

## Part II (For page numbers, see "Summary of Tables" in Part II)

Classification of the soils
Acreage and proportionate extent of the soils
Main cropland limitations and hazards
Land capability and yields per acre of crops and pasture
Prime farmland
Windbreaks suitability groups
Windbreak suitability group species list
Rangeland productivity and characteristic plant communities
Woodland understory vegetation
Forest land management
Forest land productivity
Main forest access road limitations and hazards
Recreational development

---

Building site development

Sanitary facilities

Construction materials

Water management

Engineering index properties

Physical properties of the soils

Chemical properties of the soils

Water features

Soil features



## Foreword

---

This soil survey contains information that can be used in land-planning programs in Toole County, Montana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Shirley Gammon  
State Conservationist  
Natural Resources Conservation Service



# Soil Survey of Toole County, Montana

---

Fieldwork by Bruce C. Evans, Don J. Feist, Stephen L. Herriman, James M. Hoag,  
William R. Johnson, Linda J. Richmond, and Richard M. Saunders, Natural Resources  
Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,  
in cooperation with  
the Montana Agricultural Experiment Station

## How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate map, however, soil

scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all

of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

## General Nature of the Survey Area

This section provides general information about the survey area. It describes history, settlement, and farming; markets and transportation; physiography, relief, and drainage; natural resources; geology and geomorphology; and climate.

This soil survey updates the "Soil Survey Reconnaissance of the Northern Plains of Montana," published in 1929. It provides additional information and has larger maps which show the soils in greater detail.

Toole County is in the north-central part of Montana (fig. 1). Total land area is about 1,245,400 acres, but does not include 4,594 acres of denied access in Sweetgrass Hills in the north-central part of the county. It is bounded on the north by the Province of Alberta, Canada; on the west by Glacier County; on

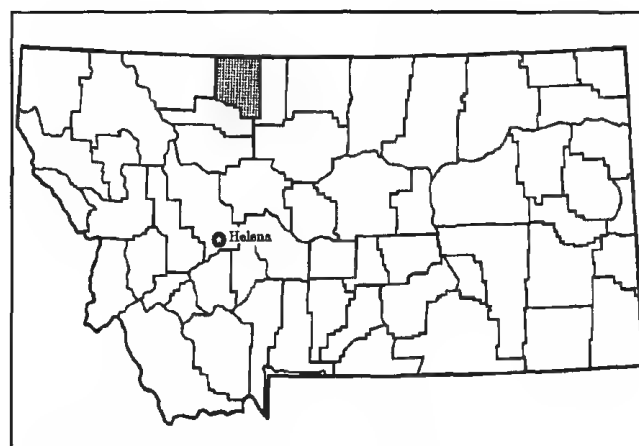


Figure 1. Location of Toole County in Montana.

the south by Pondera County; and on the east by Liberty County.

Descriptions, names, and delineations of soils in the soil survey do not fully agree with those in the adjacent Glacier County Area and Part of Pondera County, Montana survey area. Differences are the result of better knowledge of soils, modifications in series concepts, differences in intensity of mapping, or in the extent of soils within the survey.

## History, Settlement, and Farming

Toole County is an area rich in history. Lewis and Clark passed through during their 1804-1805 expedition, when it was Blackfeet Territory. The Maria's River that flows through the southern portion of the county was named by Captain Lewis. The name has since evolved to the Marias River. The river serves as a major watershed for the Lewis and Clark mountain range. The area became a great place for trade with the Indians and with Canada in the years that followed the expedition. One famous route was the 200 mile long "Whoop-Up Trail," which was a freight trail from Fort Benton to Canada. The major stopping point along the trail was Fort Conrad, which is now in southern Toole County.

Shelby, which is now the county seat of Toole County, was founded in 1891. It was first known as "Greasewood Flats," and later as "Shelby Junction." Shelby was formed because of its convenient trading location at the new Great Northern Railroad junction. In 1890 this railroad linked Great Falls to Lethbridge, Canada, and made the prairie accessible to settlers. Toole County was established as in 1914. It was named for the first governor of Montana, Joseph K. Toole. It had previously been a part of Chouteau County, as well as of Teton and Hill Counties.



Toole County is currently among the top seven counties of Montana for the production of spring wheat, Durham wheat, and barley. Before about 1910, there was no farming in the area. It was a vast, unfenced range for sheep and cattle ranchers. During the early 1900's, the town of Shelby enjoyed a thriving sheep-shearing business. Sheep were trailed to Shelby from as far away as the town of Choteau. As many as 300,000 to 400,000 sheep would be shorn in Shelby each spring. This business changed around 1910 to 1915 with the advent of the Homestead Act and the arrival of the first plows. Fences were put up and there was no longer open rangeland. In 1923, the discovery of oil and gas caused a big growth in the county population. In the 1930's, Toole County was one of about three counties in northern Montana to provide approximately 90 percent of the Nation's mustard supply.

Today Toole County is an important agricultural area in the state, producing approximately 4 1/2 million bushels of barley and 5 1/2-million bushels of wheat annually. Most of this is grown through dryland farming. Oats, hay, cattle, sheep, horses, and hogs are also important commodities. Being located along the only interstate highway in Montana that leads into Canada, Toole County still serves as an important trade junction. In addition, the east-west Burlington Northern freight and the Amtrak Hi-lines railroads pass through the county.

## Markets and Transportation

The town of Shelby is a major market and retail center for Toole County and the surrounding area. Smaller towns such as Sunburst, Devon, Dunkirk, Galata, Sweetgrass, Kevin, Oilmont, and Ethridge have various services and markets.

Toole County is a major producer of wheat and barley in Montana. Most of the grain produced is transported from the area by truck or rail. Grain terminals are located in Shelby, Devon, Sweetgrass, and in Sunburst. Cattle production is also a major agricultural business in the county, with livestock shipped to feedlots in other areas.

Two major roads crossing the survey area are Interstate 15, which runs north-south; and U.S. Highway 2, which nearly parallels the railroad in an east-west direction. The two roads intersect in Shelby. A 24-hour Port-of-Entry is located on the U.S./Canadian border at Sweetgrass, Montana. Local highways in the area are Highway 215, which runs west of Kevin; Highway 343, which runs east of Oilmont; Highway 417, which runs south of U.S. Highway 2, across the Marias river on the F-bridge,

and joins Highway 366; and Highway 366, which runs across the southeast corner of the county through Ledger. An extensive network of gravel roads provides corridors through the farming and ranching areas of the county.

Bus service runs along Interstate 15. The railway runs east-west and north-south; Amtrak passenger service runs only east-west. A small airport with two asphalt runways is located in Shelby, and a grassed runway is located in Sunburst.

## Physiography, Relief, and Drainage

Toole County is in the glaciated part of the Missouri Plateau, which is in the Great Plains Province. The parent materials in this area are the materials weathered from sedimentary and igneous rocks; the loamy and clayey deposits laid down as glacial till and glaciolacustrine deposits; and alluvium along the uplands and valleys. The landscape is mainly nearly level to rolling plains and uplands. The elevation ranges from about 2,900 feet where the Marias River flows in the southeast corner of the survey area to about 6,950 feet in the northern part of the county at West Butte, in the Sweetgrass Hills.

The largest river in the county, Marias River flows from west to east into the Lake Elwell Reservoir. Willow Creek flows from north to southeast, also into Lake Elwell Reservoir.

## Natural Resources

Toole County is known for its oil and gas production, but other natural resources in the area include gold, coal, sand, and gravel. In 1922, the first oil well was drilled in the Kevin-Sunburst Field. This discovery uncovered a large amount of oil, which led to extensive exploration and development in the area. During the 1920's, 30's, and 40's, the economy was dominated by the oil industry.

Natural gas was discovered in Sweetgrass Hills area of Toole County in 1915, and later in the Sunburst-Shelby Field. Gas exploration and development was slow because no natural gas market existed. In the late 1920's, a gas pipeline was completed to Great Falls. This provided both the Sweetgrass Hills and the Kevin-Sunburst area the needed natural gas market, and more exploration began.

Oil and gas production increased during the 1960's with new discoveries in the Sweetgrass Hills and more development of the Sunburst-Shelby Field. Gas pipelines began to cross the county, and gas wells were being drilled in areas that would previously not

have been considered commercial. Most of the new gas production was shallow gas, so compressor plants were built to deliver the low pressure natural gas to its destination.

Oil and gas continued to be developed through the 1980's, although drilling took a dramatic downward turn in the mid-1980's when oil prices dropped. Natural gas drilling is the main emphasis in Toole County today because the market for gas has increased.

Mining has played a small role in Toole County's natural resource history. Coal was discovered on West Butte in 1900. It was of limited extent, although small amounts were sold to a local market. Gold was first discovered in 1884 by a Blackfoot Indian at what is now called Gold Butte. A small mining town was founded at the base of Gold Butte for the many people who were trying to find their fortune in gold. Most of the gold came from the Placer deposit, between 1904 and 1945. Although some interest to mine more gold still exists, little development has taken place in recent years.

Small quarries of sand and gravel are scattered throughout the county but no commercial production has been developed.

## Geology and Geomorphology

Toole County is characterized by a wide variety of geomorphic features ranging from the steep-sided Sweetgrass Hills to gently rolling glacial topography. The Marias River flows across the southern part of the county and has several tributaries which drain the area. Pleistocene glacial deposits make up the majority of the surface materials with the exception of the Tertiary intrusive rocks of Sweetgrass Hills, and limited outcrops of the Cretaceous-aged sedimentary rocks along the bluffs and stream channels.

The stratigraphic sequence of rocks exposed in Toole County ranges from Mississippian age, 325 million years before present, to Quaternary deposits which are less than 2 million years old. These are described in order from oldest to youngest.

The oldest rocks, the Madison Limestone of Mississippian age, are at a small outcrop on the flanks of West Butte in the northeast corner of the county. This limestone is blue-gray in color, has distinct bedding, and has been metamorphosed locally. Overlying the Madison river is the Jurassic-aged Ellis Formation, which consists of dark-gray limestone, black limy shale, and calcareous sandstone.

The majority of bedrock underlying the glacial deposits in the area are Cretaceous-aged sedimentary deposits. The Cretaceous age was from 65 to 135 millions years before present. These strata are

characterized by alternating sequences of marine and continental material deposited as the vast inland sea that covered the area repeatedly advanced and regressed.

The oldest and most extensive of these deposits within the survey area is the Colorado Group of Lower Cretaceous age. This sedimentary strata, deposited during the last stages of an extensive marine invasion from the southeast, is composed of dark gray to black marine shale interbedded with thin bentonite beds which weather to a bright yellow, and lenses of sandstone and concretionary limestone. Marine invertebrate fossils and sharks teeth are in many of the shale beds. The Colorado Group is more than 1,000 feet thick and is exposed throughout the county in the banks of the Marias River and in most major stream valleys, as well as in the bluffs near the western county line. Typical soils derived from this formation include Neldore and Bascovy.

The remainder of the Upper Cretaceous-aged sediments belong to the Montana Group and are almost exclusively in outcrops along the bluffs in the extreme western and northeastern portions of the survey area. As the sea gradually withdrew, the Telegraph Creek Formation was deposited as continental and brackish-water sediments. The formation, the oldest within the Montana Group, is an interbedded sequence of thinly to coarsely laminated, fine grained, buff-to-gray calcareous sandstone, and gray sandy shale and shale. The Telegraph Creek Formation averages about 150 feet in thickness and is in outcrops in the upper drainages of Willow Creek and its tributaries, and along the base of the western bluffs. Typical soils derived from this formation include Cabbart, Delpoint, and Yamacall.

Following the complete withdrawal of the inland sea, the predominantly continental Eagle Formation was deposited. The formation is separated into the Upper Member and the lower Virgelle Sandstone. The Virgelle Sandstone is a grayish-buff to yellow, massive to crossbedded, friable sandstone deposit. It is an average of 85 feet thick and often forms bold cliffs exhibiting concretions of ferruginous and calcareous sandstone and hematite nodules. Also throughout the Virgelle Sandstone are fragments of petrified wood. This lower member of the Eagle Formation is considered an excellent source of drinking water for much of north-central Montana; however, most of the formation within the county is above the water table. The Upper Member of the Eagle Formation is up to 150 feet thick and is composed of alternating and interfingering beds of shale, carbonaceous shale, mudstone, siltstone, and crossbedded sandstone. This sequence indicates the return of a fluctuating

marginal-marine depositional environment. The majority of this Upper Member consists of buff, gray, and brownish-purple mudstone lenses as thick as 12 feet. Many of the shale beds are carbonaceous and contain fossil plant fragments. Fossilized wood is in the massive sandstone portions of the formation. Rounded ironstone concretions are common in the lower portions of this member. Typical soils derived from this formation include Cabbart, Delpoint, Marmarth, Dast, and Doney.

Overlying the Eagle Formation is the Claggett Shale, indicating the complete advancement of the inland sea once again. The Claggett is chiefly dark gray with iron-stained limestone and sandstone concretions. Numerous bentonite beds up to 3 feet thick occur at the base of the formation. The upper portion of the formation consists of alternating shale and crossbedded platy sandstone lenses. The total thickness of the Claggett is over 400 feet. Typical soils derived from this formation include Neldore, Bascovy, Sagedale, and Wayden.

As the inland sea regressed once more, the continental and brackish water sediments of the Judith River Formation were deposited. The Formation is characterized by alternating sandstone and shale lenses. The sandstone beds are massive, crossbedded, and calcareous; they often form ledges, benches, and cap rocks. The shale lenses are gray to brown and are usually less than 3 feet thick. They occasionally contain fossil plant matter. The maximum thickness of the Judith River formation in this county is thought to be about 600 feet. Typical soils derived from this formation include Cabbart, Delpoint, Yamacall, Doney, and Marmarth.

The Tertiary Period follows the Cretaceous Period, and ranges from 65 to 2 million years before present. In the early portion of this period, the Toole County area became geologically active and was characterized by the uplift of the Sweetgrass Arch, and by the igneous intrusion of the Sweetgrass Hills. This uplift caused the upwarping of the older Cretaceous sediments and the Mississippian-aged limestone, allowing oils and natural gas deposits to migrate up and become trapped in the anticlinal arch. This area is now referred to as the Kevin Dome.

The Sunbust Dome gas and oil fields have been in production since the early 1930's. The majority of the wells are approximately 2,000 feet in depth, and pump oil and gas from the Mississippian-aged Madison Limestone. Shallow wells also produce from the Cretaceous-aged Kootenai Formation and the Jurassic Ellis Formation.

The Sweetgrass Hills consist of three major peaks and several lesser ones. West Butte and Middle (or

Gold) Butte are located in Toole County. These peaks rise conspicuously over 3,000 feet above the plains as intrusive stocks and laccoliths. Like many of the other intrusive mountains in central Montana, the Sweetgrass Hills are composed of pale syenites unusually rich in sodium and potassium. Metamorphism of the preexisting sedimentary bedrock associated with these intrusions produced some minor veins of gold, silver, and lead. These deposits were mined; however, most of the mining operations were small and were played out in a few years. The uplift also brought to the surface the oldest sedimentary rocks exposed in the county: the Ellis and Madison Limestone formations described previously.

Although the Sweetgrass Hills are perhaps the most striking landforms in the county, the majority of the landforms and drainage patterns, and the associated soils development, are the direct result of the continental glaciation during the Pinedale ice age 15,000 years ago. With the exception of the Sweetgrass Hills, the entire county was overridden by thick continental glaciers (Colton, 1961). The bluffs along the western border of the county mark the edge of the most recent glaciers. The large ridges of glacial debris that adjoin the bluffs are the lateral moraines of the Laurentide ice sheet. Lateral moraines were deposited along the flanks of the Sweetgrass Hills as the glacier went around them. Moraines consist of unsorted clay, silt, sand, and cobbles. Much of the remaining glacial material in the county was deposited as gently rolling ground moraine.

Two separate ages of till have been identified in the survey area. The older of the two tills is the Lothair till, which is predominantly northeast of Willow Creek. The till is light tan but weathers to buff, and is unsorted with material ranging from clay-size to boulders as large as 3 feet in diameter. The till averages 50 feet in thickness. In many locations clay- and sand-sized particles predominate, and the till resembles loess. It is usually firm and compact when dry; however, when wet it becomes semiplastic. Typical soils formed from the Lothair till include Williams, Vida, and Zahill.

The younger Pondera till lies stratigraphically over the Lothair till and covers the county west and southwest of Willow Creek. The Pondera till is light brown but weathers to chocolate brown. It contains small amounts of unsorted pebbles and cobbles that lack the manganese staining associated with the pebbles and cobbles of the older Lothair till. The Pondera till is semiplastic below about a foot in depth, and the surface is usually hard and brittle. Knob and kettle topography is more common in the younger till, whereas the older till is more dissected. Typical soils

formed from the Pondera till include Telstad, Joplin, and Hillon.

Streamlined hills called drumlins are located throughout the county in a north- to south-trending direction. These ellipsoidal till deposits can be stratified and are usually in parallel groups. Their orientation is one indication of the direction of the ice movement. Many locations have layers of light-yellow to buff, even-bedded, massive silt deposits. This intra-till silt was deposited in temporary lakes as the ice sheet retreated. Windblown loess was deposited over the till to about 2 feet in thickness; however, most of this was subsequently eroded away and are now alluvial deposits within the stream channels, drainageways, and coulees.

As the ice sheets melted, several forms of glaciofluvial material were deposited and left localized deposits of silt, sand, and gravel. Some eskers and kames are located in the central portion of Toole County. Eskers are sinuous ridges of stratified sand and gravel; they are about a mile long, 30 feet wide, and 10 feet high. Kames are mound-like hills of glacial drift, composed chiefly of stratified sand and gravel. Several groups of morainal ridges occur throughout the county as well. These typically are closely spaced low ridges following the direction of ice and meltwater movement; the morainal ridges (washboard moraines) are usually oriented in groups perpendicular to the retreating glacier.

Most of the current drainages follow the coulees and outwash channels left by the glacial meltwaters. Several coulees do not host streams today. The north-south valley system that extends along the western portion of the county, closely paralleling the interstate freeway, is the largest of these ancient river drainages. It is believed by many scientists that this was the antecedent drainage of the Milk River. Today the lowland area is occupied with shallow lakes, closed depressions, and wetlands. Recent alluvium has been deposited in these broad valleys and some peat and muck deposits are in the wetland areas.

During the past 10,000 years, after the complete melting of the last glacial advance, the majority of landforms within Toole County have been formed by erosion rather than by sedimentation. Stream valleys that mostly occupy the preexisting coulees have cut down through the glacial till and bedrock, creating a dissected landscape. In the southern portion of the county and along the Marias River, the erosion and down-cutting is so extensive that the area is characteristic of badland topography.

In one of the ancient stream channels west of the town of Galata, is a 2½ foot thick bed of ash. Approximately 6,600 years before present Mount

Mazama, a volcanic mountain in southwestern Oregon, erupted and deposited ash across the country. The thickness of the Galata bed suggests that it was deposited in water, probably a very slow moving stream, and has since been partially eroded away. Although this is the only documented location of Mazama ash in the county, it is very likely to have accumulated in other alluvial valleys, and has yet to be identified.

In the Marias River and Willow Creek valleys, recent alluvium forms flood plain deposits of sand and gravel with a 2-foot-thick silt deposit on the surface. Most of the tributary valleys have small flood plains composed of sand and silt. The majority of these deposits are the result of streams eroding and redepositing the glacial sediments.

## Climate

Summertime in Toole County is generally pleasant, with cool nights and moderately warm and sunny days with slight to moderate breezes. Most rainfall is in the form of showers or thunderstorms and usually occurs in the late spring or early summer months. Most summers pass with the highest temperatures failing to reach 100 degrees, and an average year will have only 15 days with maximums of 90 degrees or higher. Weather stations at Dunkirk, Goldbutte, Shelby Airport, Sunburst, and Sweetgrass show that freezing temperatures do not occur in July, rarely in June or August, and occur more often in May and September. On rare occasions frost may occur in low lying areas at any time of the year.

Winters are not as cold as usually expected of continental locations at this latitude, largely as a result of the "Chinook" winds for which north-central Montana is noted. While subzero temperatures associated with cold waves are common in the winter, these periods seldom last more than a few days at a time, and are usually terminated by the southwesterly Chinook winds. The name "Chinook" is a loosely defined Indian term meaning "Snow Eater," and is used to describe the effect these warm winds have on the area. Changes in atmospheric pressure along the Rocky Mountain front can create strong winds and sharp temperature rises of 40 degrees or more within a period of less than 24 hours. As a result of these periodic warm winds, the ground is usually bare or nearly bare of snow for most of the winter.

The "Temperature and Precipitation" table gives data on temperature and precipitation for Toole County. The "Freeze Dates in Spring and Fall" table gives probable dates of the first and last freezing periods in the spring and fall. The "Growing Season"

table provides data on the length of the growing season.

Differences in the amount of precipitation are considerable within Toole County. The wettest areas are located in the Sweetgrass Hills. Precipitation generally falls in the form of snow during late fall, winter, and early spring. Rain can occur in any month, but usually falls in the spring and early summer months. Hail is observed occasionally during summer rain squalls and thunderstorms.

Although the average annual precipitation is low enough to classify the area as semiarid, it is important to note that about 70 percent of the annual total precipitation normally falls during the April to

September growing season. It is for this reason that Toole County is a fairly productive small-grain growing region of Montana. The combination of ideal temperatures during the growing season, long hours of summer sunshine, and 7 to 10 inches of precipitation during May to September make the climate favorable for dryland farming. Heavy fog seldom occurs and is limited to about one or two days per month, and lasts only a small part of the day. Although the area does receive slight to moderate average wind speeds, strong or extremely strong winds of over 70 mph are not commonly observed. Normal visibility is excellent.

## Temperature and Precipitation

(Recorded in the period 1912-77 at Dunkirk; 1961-1990 at Goldbutte and Sunburst; and 1958-89 at Shelby airport)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				maximum temperature higher than--	minimum temperature lower than--			Less than--	More than--		
				°F	°F			In	In		In
DUNKIRK:											
January---	25.6	3.0	14.3	54	-33	2	0.39	0.19	0.60	1	5.1
February--	31.8	8.8	20.3	58	-27	5	0.35	0.15	0.55	1	4.4
March-----	39.9	16.6	28.2	66	-19	19	0.41	0.21	0.65	1	4.4
April-----	54.1	27.3	40.7	80	2	119	0.79	0.25	1.24	2	2.9
May-----	65.8	37.7	51.8	88	20	370	1.62	0.76	2.36	4	0.6
June-----	72.5	45.3	58.9	95	31	563	2.54	1.28	3.63	6	0.0
July-----	82.8	50.3	66.6	100	35	816	1.46	0.45	2.33	3	0.0
August----	80.8	48.2	64.5	99	33	749	1.35	0.41	2.12	3	0.0
September--	69.2	38.7	54.0	92	18	431	0.98	0.30	1.54	2	0.6
October----	57.6	29.3	43.5	82	3	183	0.54	0.15	0.90	1	1.9
November--	40.5	16.6	28.5	66	-17	20	0.35	0.11	0.57	1	3.7
December--	30.2	8.0	19.1	57	-29	5	0.46	0.18	0.73	1	5.7
Yearly:											
Average--	54.2	27.5	40.9	---	---	---	---	---	---	---	---
Extreme--	108	-46	---	101	-36	---	---	---	---	---	---
Total----	---	---	---	---	---	3,282	11.25	8.60	13.63	26	29.4
GOLDBUTTE:											
January---	30.2	7.7	18.9	58	-32	14	0.40	0.17	0.59	1	9.8
February--	36.0	13.1	24.6	61	-27	17	0.30	0.16	0.43	0	7.2
March-----	42.7	19.8	31.2	67	-18	36	0.61	0.26	0.95	1	10.8
April-----	54.7	29.4	42.1	80	2	150	0.96	0.34	1.47	3	8.5
May-----	64.9	38.3	51.6	86	19	367	2.23	1.11	3.20	5	1.9
June-----	73.2	45.7	59.4	92	30	583	2.62	1.13	3.89	5	0.0
July-----	80.3	49.1	64.7	95	34	765	1.33	0.41	2.08	3	0.0
August----	79.5	48.1	63.8	97	32	738	1.63	0.68	2.43	3	0.0
September--	68.2	39.8	54.0	91	19	431	1.53	0.56	2.44	3	1.2
October----	58.2	32.4	45.3	81	5	226	0.61	0.24	0.96	2	4.2
November--	42.0	19.8	30.9	67	-18	43	0.40	0.13	0.65	1	6.4
December--	32.1	10.8	21.4	59	-34	15	0.43	0.17	0.65	1	9.0
Yearly:											
Average--	55.2	29.5	42.3	---	---	---	---	---	---	---	---
Extreme--	105	-46	---	98	-36	---	---	---	---	---	---
Total----	---	---	---	---	---	3,386	13.05	9.88	16.01	28	59.2

## Temperature and Precipitation--Continued

Month	Temperature						Precipitation					
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average growing degree days*	2 years in 10 will have--			Average number of days with 0.10 inch or more snowfall		
				maximum temperature higher than--	minimum temperature lower than--		Average	Less than--	More than--			
°F	°F	°F	°F	°F	Units	In	In	In	In			
SHELBY AIRPORT:												
January---	27.5	5.6	16.5	57	-29	9	0.27	0.10	0.43	0	0.6	
February--	35.5	12.3	23.9	63	-22	12	0.23	0.06	0.37	0	0.3	
March-----	43.3	19.3	31.3	69	-17	35	0.37	0.09	0.61	1	0.7	
April-----	55.9	29.1	42.5	81	7	147	0.68	0.32	1.19	2	0.0	
May-----	66.1	38.6	52.4	87	23	384	1.83	0.93	2.61	4	0.1	
June-----	74.8	47.0	60.9	93	32	617	2.22	0.84	3.38	4	0.2	
July-----	83.2	51.0	67.1	98	39	829	1.21	0.38	2.06	3	0.0	
August-----	82.1	49.4	65.7	99	36	800	1.13	0.54	1.78	2	0.0	
September-	70.3	39.7	55.0	92	22	453	0.91	0.22	1.45	2	0.0	
October---	60.1	31.5	45.8	83	6	233	0.33	0.05	0.54	0	0.1	
November--	41.3	18.2	29.8	68	-18	34	0.28	0.04	0.46	0	0.5	
December--	31.2	9.5	20.3	58	-30	9	0.24	0.06	0.38	0	1.7	
Yearly:												
Average--	55.9	29.3	42.6	---	---	---	---	---	---	---	---	
Extreme--	106	-43	---	100	-33	---	---	---	---	---	---	
Total----	---	---	---	---	---	3,562	9.70	6.79	11.87	18	4.3	
SUNBURST:												
January---	34.5	14.6	24.6	57	-23	11	0.39	0.23	0.56	1	3.8	
February--	34.7	13.1	23.9	62	-28	15	0.31	0.12	0.47	1	3.5	
March-----	43.6	22.7	33.1	66	-7	34	0.64	0.15	1.03	1	4.4	
April-----	57.8	31.7	44.8	82	9	198	0.92	0.30	1.43	2	4.3	
May-----	66.8	40.3	53.5	89	23	425	2.22	1.22	3.10	5	1.1	
June-----	74.6	47.2	60.9	96	34	626	2.20	1.07	3.17	5	0.0	
July-----	81.4	51.3	66.3	98	38	807	1.34	0.41	2.09	3	0.0	
August-----	80.0	50.7	65.4	96	36	773	1.43	0.51	2.20	3	0.0	
September-	68.6	41.6	55.1	93	24	463	1.24	0.35	1.96	3	0.9	
October---	57.9	33.4	45.7	82	6	237	0.58	0.19	0.93	1	2.4	
November--	40.8	20.7	30.8	66	-13	36	0.42	0.17	0.69	1	3.9	
December--	30.0	10.9	20.4	57	-30	8	0.42	0.21	0.64	1	4.3	
Yearly:												
Average--	55.9	31.5	43.7	---	---	---	---	---	---	---	---	
Extreme--	103	-39	---	100	-32	---	---	---	---	---	---	
Total----	---	---	---	---	---	3,632	12.13	9.11	14.95	27	28.6	

## Freeze Dates in Spring and Fall

(Recorded in the period 1922-78 at Dunkirk, 1948-91 at Goldbutte, 1958-89 at Shelby airport, and 1980-91 at Sunburst)

Probability	Temperature		
	24 degrees F	28 degrees F	32 degrees F
<b>DUNKIRK:</b>			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 17	May 30	June 19
2 years in 10 later than---	May 11	May 24	June 12
5 years in 10 later than---	Apr. 30	May 13	May 31
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 10	Sept. 5	Aug. 24
2 years in 10 earlier than-	Sept. 16	Sept. 10	Aug. 29
5 years in 10 earlier than-	Sept. 27	Sept. 20	Sept. 9
<b>GOLDBUTTE:</b>			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 18	May 27	June 17
2 years in 10 later than---	May 13	May 23	June 12
5 years in 10 later than---	May 3	May 15	June 2
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 10	Sept. 4	Sept. 16
2 years in 10 earlier than-	Sept. 16	Sept. 9	Aug. 22
5 years in 10 earlier than-	Sept. 28	Sept. 20	Sept. 3



## Freeze Dates in Spring and Fall--Continued

Probability	Temperature		
	24 degrees F	28 degrees F	32 degrees F
SHELBY AIRPORT:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 7	May 23	June 3
2 years in 10 later than---	May 1	May 18	May 30
5 years in 10 later than---	Apr. 22	May 8	May 21
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 16	Sept. 11	Sept. 1
2 years in 10 earlier than-	Sept. 22	Sept. 16	Sept. 5
5 years in 10 earlier than-	Oct. 3	Sept. 26	Sept. 12
SUNBURST:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 10	May 18	June 4
2 years in 10 later than---	May 5	May 14	May 29
5 years in 10 later than---	Apr. 26	May 5	May 19
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 23	Sept. 12	Sept. 2
2 years in 10 earlier than-	Sept. 28	Sept. 17	Sept. 7
5 years in 10 earlier than-	Oct. 8	Oct. 28	Oct. 17

## Growing Season

(Recorded in the period 1922-78 at Dunkirk, 1948-91 at Goldbutte,  
1958-89 at Shelby airport, 1980-91 at Sunburst)

Probability	Daily Minimum Temperature		
	Higher than 24 degrees F	Higher than 28 degrees F	Higher than 32 degrees F
	Days	Days	Days
<b>DUNKIRK:</b>			
9 years in 10-----	116	102	74
8 years in 10-----	124	109	83
5 years in 10-----	139	123	100
2 years in 10-----	154	136	116
1 year in 10-----	162	143	125
<b>GOLDBUTTE:</b>			
9 years in 10-----	113	103	67
8 years in 10-----	120	108	75
5 years in 10-----	135	119	91
2 years in 10-----	150	130	106
1 year in 10-----	157	136	114
<b>SHELBY AIRPORT:</b>			
9 years in 10-----	130	113	96
8 years in 10-----	137	119	102
5 years in 10-----	150	132	112
2 years in 10-----	163	144	123
1 year in 10-----	170	150	128
<b>SUNBURST:</b>			
9 years in 10-----	133	115	97
8 years in 10-----	141	123	104
5 years in 10-----	156	140	117
2 years in 10-----	170	156	130
1 year in 10-----	178	165	137

# Formation and Classification of the Soils

---

This section relates the major factors of soil formation to the soils in the survey area and describes the system of soil classification. The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

## Formation of the Soils

Soil is a natural, three-dimensional body on the earth's surface. It has properties that result from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over a period of time.

Although there are many different soils, each soil is the result of the interaction of the same five factors. These factors are the physical and chemical composition of the parent material, the effect of climate on the parent material, the kinds of plants and the organisms living in the soil, the relief of the land, and the length of time it took for the soil to form.

Within short distances the combination of these factors varies, and consequently the soils that form differ in fertility, productivity, and physical and chemical characteristics. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in Toole County.

### Climate

Climate, an active force in the formation of soils, is determined mainly by temperature and precipitation. In Toole County the winters are cold, the springs are cool and moist, and the summers are hot and dry. Arctic cold waves and gusty warm southwest winds are part of seasonal weather patterns. Erosion and alternate freezing and thawing break down rocks into material in which soils form. The weathered material is further broken down by chemical reactions such as solution and hydration.

The precipitation and temperature affect the kind and amount of vegetation that grows on the soil. Vegetation decays to produce organic matter in the soil. Soils that have cool temperatures and high precipitation generally contain more organic matter

and are dark in color. Soils with warm temperature and low precipitation generally contain less organic matter and are light in color.

The average annual precipitation ranges from about 10 to 14 inches on the glaciated uplands, and from about 15 to 22 inches in the Sweetgrass Hills. The average annual temperature ranges from 38 to 45 degrees F.

### Living Organisms

Living organisms are active in the formation of soils. Plants, animals, insects, and micro-organisms affect gains or losses in organic matter, plant nutrients in the soil, and changes in porosity and structure.

Roots, rodents, and insects penetrate the soil and alter its structure. Leaves, roots, and entire plants that remain in the surface layer are changed to humus by microorganisms, chemicals in the soil, and by insects. Fungi and algae also contribute to the decomposition of bedrock. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common rodents in the area are ground squirrels, badgers, prairie dogs, and rabbits.

The vegetation in the survey area consists mainly of short grasses, mid grasses, and shrubs on the plains; and of tall grasses, Douglas fir, and lodgepole pine in the Sweetgrass Hills.

### Topography

Topography, or relief, is determined by glaciation and the age and resistance of geologic formations to erosion by wind and water. It influences soil development through its effect on drainage and runoff. Runoff water has carved deep valleys on eroded uplands of this survey area. These rugged areas contrast sharply with the smoother areas of the glacial till plain.

On uplands, the number and distinction of soil horizons generally decrease as the slope increases. Soils on steep slopes with rapid runoff have many characteristics similar to those of soils formed in arid climates. Nearly level to moderately sloping soils have the characteristics of soils that are the most common in Toole County. Examples of this general principle are

the Hillon soils that are moderately steep or steep and the Telstad soils that are nearly level to moderately sloping.

### Parent Material

Most of the soils in Toole County formed in glacial till or in glacial outwash material. Some of the soils formed in alluvium derived from mixed sources, and other soils formed in material that weathered from shale, sandstone, limestone, or igneous rocks.

The soils that formed in glacial till, such as the Telstad or Joplin series, generally are loamy while the Scobey and Kevin series generally are clayey. Soils that formed in soft sandstone, such as the Cabbart and Delpoint series, generally are loamy; soils that formed in shale, such as the Neldore series, are clayey. The soils that formed in mixed alluvium derived from glacial till, sandstone, or shale, such as the Havre series, are loamy.

Many soils in the survey area have accumulated lime, sodium, and other salts from the parent material. The salts and sodium make these soils slightly to moderately saline or alkali, and limit the amount and kind of plant cover.

### Time

The changes that take place in a soil over long periods of time are called soil genesis. Distinct horizons, or layers, develop in the soils as a result of these changes. The length of time that parent materials have been in place and exposed to climate and living organisms is generally reflected in the degree to which the soil profile has developed. The kinds and arrangement of layers are called the soil morphology, and they are described in terms of color, texture, structure, consistence, thickness, permeability, and chemistry.

Soils are classified as young to mature. The age of a soil is determined from the thickness of the A horizon, the content of clay and organic matter, the depth to which soluble material is leached, and the form and distribution of calcium carbonate and gypsum in the soil.

Young soils show very little profile development. Havre loam, a soil of the Entisol order, is an example of a young soil. It is on a flood plain adjacent to a flowing stream. The soil contains little organic matter with which to form an A horizon; it has little clay accumulation; and it has little translocation of carbonates within the profile.

The Evanston soil formed in parent material that is similar to that of the Havre loam but which is much older. These soils formed in alluvium on uplands. They contain enough organic matter to have a dark-colored

A horizon, a distinct clay accumulation in a Bt horizon, and nearly all of the carbonates have been leached to a depth of about 13 inches.

Many of the sloping and steep, shallow and very shallow soils appear to have been in the process of formation for about as long as some of the more developed, less sloping soils. However, erosion has removed the soil as fast as it formed. In this case the effect of time has been offset by the effect of relief.

## Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

**ORDER.** Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

**SUBORDER.** Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (Bor, meaning cool, plus *oll*, from Mollisol).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiborolls (*Argi*, meaning having an argillic horizon, plus *boroll*, the suborder of the Mollisols that have a cool climate).

**SUBGROUP.** Each great group has a typical subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies

the subgroup that typifies the great group. An example is Typic Argiborolls.

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A

family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed Typic Argiborolls.

**SERIES.** The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series. An example is the Williams series.

## Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Absher-----	Fine, montmorillonitic Typic Natriboralfs
*Acel-----	Fine, montmorillonitic Mollic Eutroboralfs
Assinniboine-----	Fine-loamy, mixed Aridic Argiborolls
Attewan-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Bascovy-----	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Bearpaw-----	Fine, montmorillonitic Typic Argiborolls
Benz-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Bigsag-----	Fine, montmorillonitic (calcareous), frigid Typic Halaquepts
Bigsandy-----	Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents
Blanchard-----	Mixed, frigid Typic Ustipsamments
Brockway-----	Fine silty, mixed, frigid Calcicorthidic Ustochrepts
Busby-----	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Cabba-----	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart-----	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Chinook-----	Coarse-loamy, mixed Aridic Haploborolls
Cozberg-----	Coarse-loamy, mixed Aridic Haploborolls
Creed-----	Fine, montmorillonitic Typic Natriboralfs
Daglum-----	Fine, montmorillonitic Vertic Natriborolls
Dast-----	Coarse-loamy, mixed, frigid Typic Ustochrepts
Degrad-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Delpoint-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Doney-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Elloam-----	Fine, montmorillonitic Typic Natriboralfs
Enbar-----	Fine-loamy, mixed Cumulic Haploborolls
Ethridge-----	Fine, montmorillonitic Aridic Argiborolls
Evanston-----	Fine-loamy, mixed Aridic Argiborolls
Evanston, calcareous----	Fine-loamy, mixed Aridic Argiborolls
Fairway-----	Fine-loamy, mixed Fluvaquentic Haploborolls
Farnuf-----	Fine-loamy, mixed Typic Argiborolls
Ferd-----	Fine, montmorillonitic Glossic Eutroboralfs
Fleak-----	Mixed, frigid, shallow Aridic Ustipsamments
Flowerree-----	Fine-silty, mixed Aridic Haploborolls
Gerber-----	Fine, montmorillonitic Vertic Argiborolls
Gerdum-----	Fine, montmorillonitic Typic Natriboralfs
Glendive-----	Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hanly-----	Sandy, mixed, frigid Aridic Ustifluvents
Harlake-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Havre-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hedstrom-----	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Hillon-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Joplin-----	Fine-loamy, mixed Aridic Argiborolls
Joplin, calcareous-----	Fine-loamy, mixed Aridic Argiborolls
Kenilworth-----	Fine-loamy, mixed Aridic Argiborolls
Kevin-----	Fine-loamy, mixed Aridic Argiborolls
Kevin, calcareous-----	Fine-loamy, mixed Aridic Argiborolls
Kiwanis-----	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Typic Ustifluvents
Kobase-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Korchea-----	Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents
Kremlin-----	Fine-loamy, mixed Aridic Haploborolls
Lambeth-----	Fine-silty, mixed (calcareous), frigid Aridic Ustorthents
Lihen-----	Sandy, mixed Entic Haploborolls
Lonna-----	Fine-silty, mixed, frigid Aridic Ustochrepts

## Classification of the Soils--continued

Soil name	Family or higher taxonomic class
Macar-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Marias-----	Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Marmarth-----	Fine-loamy, mixed Aridic Argiborolls
Marvan-----	Fine, montmorillonitic, frigid Sodic Haplusterts
McKenzie-----	Fine, montmorillonitic, frigid Chromic Endoaquerts
Meadowcreek-----	Fine-loamy over sandy or sandy-skeletal, mixed Fluvaquentic Haploborolls
Neldore-----	Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents
Nesda-----	Sandy-skeletal, mixed Fluventic Haploborolls
Nesda, cool-----	Sandy-skeletal, mixed Fluventic Haploborolls
Nishon-----	Fine, montmorillonitic, frigid Typic Albaqualfs
Nobe-----	Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents
Nunemaker-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Perma-----	Loamy-skeletal, mixed Typic Haploborolls
Phillips-----	Fine, montmorillonitic Typic Eutroboralfs
Reeder-----	Fine-loamy, mixed Typic Argiborolls
Rivra-----	Sandy-skeletal, mixed, frigid Aridic Ustifluvents
Roy-----	Clayey-skeletal, mixed Typic Argiborolls
Ryell-----	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Aridic Ustifluvents
Sagedale-----	Fine, montmorillonitic, frigid Typic Ustochrepts
Savage-----	Fine, montmorillonitic Typic Argiborolls
Scobey-----	Fine, montmorillonitic Aridic Argiborolls
Scobey, calcareous-----	Fine, montmorillonitic Aridic Argiborolls
Shambo-----	Fine-loamy, mixed Typic Haploborolls
Stemple-----	Loamy-skeletal, mixed Typic Paleboralfs
Sunburst-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Tally-----	Coarse-loamy, mixed Typic Haploborolls
Tanna-----	Fine, montmorillonitic Aridic Argiborolls
Telstad-----	Fine-loamy, mixed Aridic Argiborolls
Tinsley-----	Sandy-skeletal, mixed, frigid Typic Ustorthents
Trudau-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Turner-----	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Vaeda-----	Fine, montmorillonitic, nonacid, frigid Aridic Ustorthents
Vanda-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Vida-----	Fine-loamy, mixed Typic Argiborolls
Vida, calcareous-----	Fine-loamy, mixed Typic Argiborolls
Whitlash-----	Loamy-skeletal, mixed Lithic Haploborolls
Williams-----	Fine-loamy, mixed Typic Argiborolls
Yamacall-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Yetull-----	Mixed, frigid Typic Ustipsamments
Zahill-----	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents
Zahl-----	Fine-loamy, mixed Typic Calciborolls

## Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
2A	Riverwash-----	213	*
4B	Brockway silt loam, 2 to 4 percent slopes-----	325	*
4C	Brockway silt loam, 4 to 8 percent slopes-----	279	*
12C	Tally sandy loam, 2 to 8 percent slopes-----	835	*
12D	Tally sandy loam, 8 to 15 percent slopes-----	219	*
13B	Tanna clay loam, 0 to 4 percent slopes-----	2,768	0.2
13C	Tanna clay loam, 4 to 8 percent slopes-----	579	*
14A	McKenzie silty clay, 0 to 1 percent slope-----	3,068	0.2
15F	Lambeth silt loam, 15 to 70 percent slopes-----	4,962	0.4
16B	Degrad loam, 0 to 4 percent slopes-----	4,219	0.3
19B	Kenilworth loam, 0 to 4 percent slopes-----	3,531	0.3
20C	Cabba loam, 4 to 8 percent slopes-----	704	*
20D	Cabba loam, 8 to 15 percent slopes-----	255	*
22E	Hillon clay loam, 8 to 25 percent slopes-----	3,024	0.2
22F	Hillon clay loam, 25 to 60 percent slopes-----	12,336	1.0
23A	Acel silty clay loam, 0 to 2 percent slopes-----	3,842	0.3
26B	Absher clay, 0 to 4 percent slopes-----	1,675	0.1
27B	Attewan loam, 0 to 4 percent slopes-----	1,883	0.2
28A	Nishon clay loam, 0 to 1 percent slope-----	7,517	0.6
29B	Nunemaker silty clay loam, 0 to 4 percent slopes-----	14,623	1.2
29C	Nunemaker silty clay loam, 4 to 8 percent slopes-----	2,667	0.2
30B	Marvan silty clay, 0 to 4 percent slopes-----	6,079	0.5
30C	Marvan silty clay, 4 to 8 percent slopes-----	698	*
32B	Kobase silty clay loam, 0 to 4 percent slopes-----	5,090	0.4
32C	Kobase silty clay loam, 4 to 8 percent slopes-----	1,644	0.1
33B	Phillips clay loam, 0 to 4 percent slopes-----	4,728	0.4
35B	Assinniboine fine sandy loam, 0 to 4 percent slopes-----	4,167	0.3
35C	Assinniboine fine sandy loam, 4 to 8 percent slopes-----	484	*
36C	Chinook loam, 0 to 8 percent slopes-----	1,212	*
37B	Evanston clay loam, 0 to 4 percent slopes-----	39,616	3.2
37C	Evanston clay loam, 4 to 8 percent slopes-----	1,452	0.1
38B	Ethridge clay loam, 0 to 4 percent slopes-----	10,520	0.8
39B	Ferd loam, 0 to 4 percent slopes-----	10,375	0.8
42B	Joplin clay loam, 0 to 4 percent slopes-----	50,034	4.0
42C	Joplin clay loam, 4 to 8 percent slopes-----	4,716	0.4
44B	Kevin clay loam, 0 to 4 percent slopes-----	30,989	2.5
44C	Kevin clay loam, 4 to 8 percent slopes-----	3,286	0.3
45C	Cozberg fine sandy loam, 2 to 8 percent slopes-----	1,654	0.1
45D	Cozberg fine sandy loam, 8 to 15 percent slopes-----	446	*
47B	Maxias silty clay, 0 to 4 percent slopes-----	10,711	0.9
48B	Vanda silty clay, 0 to 4 percent slopes-----	7,033	0.6
48C	Vanda silty clay, 4 to 8 percent slopes-----	374	*
49C	Flowerree silt loam, 2 to 8 percent slopes-----	228	*
50B	Telstad clay loam, 0 to 4 percent slopes-----	2,849	0.2
51B	Turner loam, 0 to 4 percent slopes-----	1,739	0.1
53D	Sunburst clay loam, 8 to 15 percent slopes-----	281	*
53E	Sunburst clay loam, 15 to 25 percent slopes-----	3,720	0.3
53F	Sunburst clay loam, 25 to 70 percent slopes-----	2,637	0.2
54B	Trudau loam, 0 to 4 percent slopes-----	9,883	0.8
58B	Lonna silt loam, 0 to 4 percent slopes-----	2,345	0.2
59B	Hedstrom fine sandy loam, 0 to 4 percent slopes-----	413	*
60A	Havre silty clay loam, 0 to 2 percent slopes-----	821	*
62A	Vaeda silty clay loam, 0 to 2 percent slopes-----	4,226	0.3
64B	Nobe clay, 0 to 4 percent slopes-----	2,359	0.2
67B	Bearpaw clay loam, 0 to 4 percent slopes-----	1,308	0.1
68B	Gerber clay, 0 to 4 percent slopes-----	374	*
69A	Vida clay loam, 0 to 2 percent slopes-----	1,120	*
69C	Vida clay loam, 2 to 8 percent slopes-----	1,970	0.2
71F	Roy gravelly clay loam, 25 to 60 percent slopes-----	96	*
72F	Zahill loam, 25 to 45 percent slopes-----	3,603	0.3
73D	Yetull loamy fine sand, 0 to 15 percent slopes-----	2,575	0.2
74B	Shambo loam, 0 to 4 percent slopes-----	2,338	0.2

\*See footnote at end of table



## Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
75B	Farnuf clay loam, 0 to 3 percent slopes-----	8,045	0.6
75C	Farnuf clay loam, 3 to 8 percent slopes-----	1,945	0.2
77C	Tinsley gravelly sandy loam, 2 to 8 percent slopes-----	1,650	0.1
77E	Tinsley gravelly sandy loam, 8 to 25 percent slopes-----	575	*
79B	Yamacall loam, 0 to 4 percent slopes-----	3,424	0.3
79C	Yamacall loam, 4 to 8 percent slopes-----	1,692	0.1
79D	Yamacall loam, 8 to 15 percent slopes-----	1,507	0.1
80B	Williams clay loam, 0 to 3 percent slopes-----	4,059	0.3
80C	Williams clay loam, 3 to 8 percent slopes-----	2,350	0.2
82B	Savage silty clay loam, 0 to 3 percent slopes-----	3,357	0.3
85B	Benz clay loam, 0 to 4 percent slopes-----	770	*
88C	Perma gravelly loam, 2 to 8 percent slopes-----	2,196	0.2
88E	Perma gravelly loam, 8 to 25 percent slopes-----	1,008	*
90A	Marlake silty clay loam, 0 to 2 percent slopes-----	346	*
94C	Busby fine sandy loam, 2 to 8 percent slopes-----	4,313	0.3
94D	Busby fine sandy loam, 8 to 15 percent slopes-----	323	*
96C	Macar loam, 4 to 8 percent slopes-----	747	*
96D	Macar loam, 8 to 15 percent slopes-----	554	*
98B	Kremlin loam, 0 to 4 percent slopes-----	2,144	0.2
101A	Hanly-Glendive-Havre complex, 0 to 2 percent slopes-----	730	*
110A	Korchea-Kiwanis complex, 0 to 2 percent slopes-----	189	*
141A	McKenzie clay, saline, 0 to 2 percent slopes-----	1,874	0.2
143A	Meadowcreek loam, 0 to 2 percent slopes-----	167	*
144A	Bigsandy silty clay loam, 0 to 1 percent slope-----	690	*
162B	Degradand sandy loam, 0 to 4 percent slopes-----	767	*
171F	Delpoint-Cabbart clay loams, 25 to 60 percent slopes-----	600	*
181D	Doney-Cabba complex, 4 to 15 percent slopes-----	385	*
191B	Kenilworth fine sandy loam, 0 to 4 percent slopes-----	5,737	0.5
200F	Badland-----	83	*
201F	Cabba-Rock outcrop complex, 25 to 70 percent slopes-----	2,463	0.2
202F	Cabba-Dast fine sandy loams, 25 to 45 percent slopes-----	2,233	0.2
203E	Cabba-Doney clay loams, 8 to 25 percent slopes-----	1,096	*
211F	Cabbart-Rock outcrop complex, 25 to 70 percent slopes-----	2,890	0.2
212F	Cabbart-Hillon complex, 25 to 45 percent slopes-----	1,915	0.2
213E	Cabbart-Delpoint loams, 8 to 25 percent slopes-----	718	*
221E	Hillon-Kevin clay loams, 15 to 25 percent slopes-----	1,163	*
222E	Hillon-Neldore complex, 8 to 25 percent slopes-----	8,917	0.7
222F	Hillon-Neldore complex, 25 to 70 percent slopes-----	19,338	1.6
224E	Hillon-Joplin loams, 8 to 25 percent slopes-----	11,218	0.9
241C	Marmarth-Evanston loams, 0 to 8 percent slopes-----	1,746	0.1
251C	Bascovy clay loam, 2 to 8 percent slopes-----	2,541	0.2
252D	Bascovy-Neldore clays, 8 to 15 percent slopes-----	885	*
261A	Absher-Nobe complex, 0 to 2 percent slopes-----	4,104	0.3
272B	Attewan sandy loam, 0 to 4 percent slopes-----	260	*
300F	Rubble land-----	1,702	0.1
311B	Creed-Gerdrum-Absher complex, 0 to 4 percent slopes-----	19,930	1.6
321B	Kobase silty clay loam, calcareous, 0 to 4 percent slopes-----	7,707	0.6
321C	Kobase silty clay loam, calcareous, 4 to 8 percent slopes-----	3,489	0.3
323C	Sagedale silty clay loam, 2 to 8 percent slopes-----	678	*
331B	Phillips-Elloam clay loams, 0 to 4 percent slopes-----	15,229	1.2
332B	Phillips-Kevin clay loams, 0 to 4 percent slopes-----	38,445	3.1
364C	Chinook fine sandy loam, 0 to 8 percent slopes-----	13,887	1.1
372B	Evanston fine sandy loam, 0 to 4 percent slopes-----	2,086	0.2
373C	Evanston-Tinsley complex, 2 to 8 percent slopes-----	289	*
374B	Evanston loam, 0 to 4 percent slopes-----	992	*
374C	Evanston loam, 4 to 8 percent slopes-----	585	*
378B	Evanston complex, 0 to 4 percent slopes-----	7,328	0.6
379C	Evanston-Busby complex, 2 to 8 percent slopes-----	896	*
384B	Ethridge silty clay loam, 0 to 4 percent slopes-----	3,717	0.3
386B	Ethridge-Evanston clay loams, 0 to 4 percent slopes-----	3,229	0.2
391B	Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes-----	9,323	0.7
391C	Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes-----	539	*

\*See footnote at end of table

## Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
402A	Gerdrum-Absher complex, 0 to 2 percent slopes-----	15,281	1.2
411B	Reeder-Cabba complex, 0 to 4 percent slopes-----	1,280	0.1
411C	Reeder-Cabba complex, 4 to 8 percent slopes-----	2,166	0.2
421C	Joplin-Millon clay loams, 2 to 8 percent slopes-----	41,552	3.3
421D	Joplin-Millon clay loams, 8 to 15 percent slopes-----	23,838	1.9
423B	Joplin-Millon clay loams, 0 to 3 percent slopes-----	24,630	2.0
423C	Millon-Joplin clay loams, 3 to 8 percent slopes-----	37,658	3.0
424C	Joplin-Millon gravelly loams, 3 to 8 percent slopes-----	3,750	0.3
425C	Joplin-Telstad clay loams, 2 to 8 percent slopes-----	1,287	0.1
426B	Joplin loam, 0 to 4 percent slopes-----	2,471	0.2
427B	Joplin complex, 0 to 4 percent slopes-----	74,784	6.0
427C	Joplin complex, 4 to 8 percent slopes-----	12,791	1.0
441C	Kevin-Millon clay loams, 2 to 8 percent slopes-----	9,050	0.7
443B	Kevin-Ferd complex, 0 to 4 percent slopes-----	24,067	1.9
444B	Kevin, calcareous-Ferd complex, 0 to 4 percent slopes-----	1,675	0.1
445B	Kevin complex, 0 to 4 percent slopes-----	17,008	1.4
445C	Kevin complex, 4 to 8 percent slopes-----	4,911	0.4
446C	Kevin-Elloam clay loams, 2 to 8 percent slopes-----	2,103	0.2
451A	Cozberg-Lihen fine sandy loams, 0 to 2 percent slopes-----	810	*
451C	Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes-----	2,334	0.2
481A	Bigsag silty clay, 0 to 2 percent slopes-----	1,563	0.1
482A	Vanda-Marvan, saline, clays, 0 to 2 percent slopes-----	2,703	0.2
503B	Telstad-Joplin clay loams, 0 to 4 percent slopes-----	31,855	2.6
503C	Telstad-Joplin clay loams, 4 to 8 percent slopes-----	5,896	0.5
504B	Telstad-Joplin loams, 0 to 4 percent slopes-----	14,277	1.1
504C	Telstad-Joplin loams, 4 to 8 percent slopes-----	2,283	0.2
511C	Turner sandy loam, 2 to 6 percent slopes-----	685	*
521B	Elloam-Absher clay loams, 0 to 4 percent slopes-----	3,730	0.3
551E	Lihen-Blanchard loamy sands, 8 to 25 percent slopes-----	858	*
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes-----	40,655	3.3
561C	Scobey-Kevin clay loams, 4 to 8 percent slopes-----	2,511	0.2
561D	Scobey-Kevin clay loams, 8 to 15 percent slopes-----	996	*
563B	Scobey clay loam, 0 to 4 percent slopes-----	143	*
571A	Ryell-Rivra complex, 0 to 2 percent slopes-----	489	*
572A	Ryell-Havre loams, 0 to 2 percent slopes-----	45	*
581B	Lonna silty clay loam, 0 to 4 percent slopes-----	7,116	0.6
581C	Lonna silty clay loam, 4 to 8 percent slopes-----	1,054	*
582B	Lonna-Ethridge complex, 0 to 4 percent slopes-----	3,105	0.2
601A	Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded-----	7,381	0.6
603A	Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded-----	4,864	0.4
651E	Fleak-Lihen fine sandy loams, 8 to 25 percent slopes-----	207	*
673B	Bearpaw-Daglum clay loams, 0 to 4 percent slopes-----	2,127	0.2
691B	Vida-Vida, calcareous-Williams clay loams, 0 to 3 percent slopes-----	6,457	0.5
691C	Vida-Vida, calcareous-Williams clay loams, 3 to 8 percent slopes-----	24,572	2.0
692D	Vida, calcareous-Williams-Zahill clay loams, 4 to 15 percent slopes-----	14,386	1.2
694C	Vida-Williams clay loams, 3 to 8 percent slopes-----	28,592	2.3
695D	Vida-Williams-Zahill clay loams, 4 to 15 percent slopes-----	31,558	2.5
696E	Vida-Zahill clay loams, 8 to 25 percent slopes-----	15,921	1.3
697C	Vida-Bearpaw clay loams, 2 to 8 percent slopes-----	14,631	1.2
698D	Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes-----	5,994	0.5
698E	Vida-Zahill-Nishon clay loams, 0 to 25 percent slopes-----	458	*
721E	Zahill-Zahl complex, 15 to 25 percent slopes-----	5,695	0.4
721F	Zahill-Zahl complex, 25 to 60 percent slopes-----	15,749	1.3
722F	Zahill-Dast-Cabba complex, 25 to 65 percent slopes-----	848	*
743A	Shambo-Fairway loams, 0 to 2 percent slopes-----	2,019	0.2
761B	Fairway-Bigsandy loams, 0 to 4 percent slopes-----	1,687	0.1
793B	Yamacall loam, calcareous, 0 to 4 percent slopes-----	3,138	0.2
793C	Yamacall loam, calcareous, 4 to 8 percent slopes-----	3,958	0.3
793D	Yamacall loam, calcareous, 8 to 15 percent slopes-----	1,738	0.1
831E	Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes-----	205	*
861F	Stemple, high elevation-Rubble land complex, 25 to 70 percent slopes-----	1,167	*
862F	Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes-----	2,363	0.2

\*See footnote at end of table

## Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
871B	Nesda complex, 0 to 4 percent slopes-----	227	*
881E	Perma-Whitlash cobbly loams, 8 to 25 percent slopes-----	1,500	0.1
881F	Perma-Whitlash cobbly loams, 25 to 70 percent slopes-----	11,072	0.9
942C	Busby-Chinook fine sandy loams, 2 to 8 percent slopes-----	1,768	0.1
961B	Macar clay loam, 0 to 4 percent slopes-----	238	*
971C	Neldore-Bascovy clays, 2 to 8 percent slopes-----	5,994	0.5
971F	Neldore-Bascovy clays, 8 to 45 percent slopes-----	7,266	0.6
972F	Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes-----	20,591	1.6
DA	Denied access-----	4,594	0.4
M-W	Miscellaneous water-----	30	*
W	Water-----	17,491	1.4
	Total-----	1,245,400	100.0

\* Less than 0.1 percent.



## Soil Series and Detailed Soil Map Units

---

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (*U.S. Dep. Agric., 1993*). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (*U.S. Dep. Agric, 1975*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed soil maps in Part III of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, are mapped without areas of minor components of other taxonomic classes. Consequently, map units are made up of the soils or miscellaneous areas for which they are named and some areas of minor components that belong to other taxonomic classes.

Minor components have properties and behavioral characteristics divergent enough to affect use or to

require different management. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, rarely flooded is a phase of the Havre series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes.



A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Telstad-Joplin loams, 0 to 4 percent slopes is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Badland is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of the survey gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- "Range" section
- "Forest Land" section
- "Agronomy" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

## Absher Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Moderately well drained

*Permeability:* Very slow (less than 0.06 inch/hour)

*Landform:* Till plains, stream terraces, or alluvial fans

*Parent material:* Glacial till or alluvium

*Slope range:* 0 to 4 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Typic Natriboralfs

### Typical Pedon

Absher clay (mixed) in an area of Creed-Gerdrum-Absher complex, 0 to 4 percent slopes; in a rangeland

area, 1,400 feet south and 1,500 feet east of the northwest corner of sec. 17, T. 34 N., R. 2 W.

**E**—0 to 1 inch; grayish brown (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate very thin platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots and common very fine and fine pores; mildly alkaline; abrupt smooth boundary.

**B<sub>tn</sub>**—1 to 6 inches; light brownish gray (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure; hard, firm, sticky and plastic; common very fine and fine roots and pores; common distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

**B<sub>tkn</sub>**—6 to 13 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderately fine and medium prismatic structure; hard, firm, sticky and very plastic; few fine roots and few very fine and fine pores; common distinct clay films on faces of peds; common soft masses of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

**B<sub>tknyz</sub>**—13 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; hard, firm very sticky and very plastic; few fine roots and pores; common distinct clay films on faces of peds; common soft masses of lime and gypsum; common fine and medium crystals of other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

**B<sub>nyz</sub>**—23 to 36 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; few fine roots and pores; common medium nests of gypsum crystals; many fine and medium crystals of other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

**B<sub>nz</sub>**—36 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark brownish gray (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; many fine and medium soft masses of salt; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 1 to 21 inches

*Content of clay in the control section:* 35 to 60 percent

*Depth to the B<sub>tknyz</sub> horizon:* 6 to 20 inches

*E horizon*

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Texture: Loam (where mixed with the Bt horizon, textures are mainly clay)  
 Clay content: 15 to 55 percent  
 Rock fragments: 0 to 30 percent pebbles and 0 to 5 percent cobbles  
 Electrical conductivity: 4 to 8 mmhos/cm  
 Reaction: pH 6.6 to 8.4  
**Note:** Some pedons have a very thin A horizon.

*Btn horizon*

Hue: 2.5Y, 7.5YR, or 10YR  
 Value: 4, 5, or 6 dry; 4 or 5 moist  
 Chroma: 1, 2, or 3  
 Texture: Silty clay, clay, or clay loam  
 Clay content: 35 to 60 percent  
 Structure: Moderate, strong columnar, or prismatic  
 Consistence: Very hard or extremely hard when dry  
 Rock fragments: 0 to 15 percent pebbles  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Sodium adsorption ratio: 18 to 70  
 Reaction: pH 6.6 to 9.0

*Btkn and Btknyz horizons*

Hue: 2.5Y, 10YR, or 7.5YR  
 Value: 4, 5, or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Clay loam, clay, or silty clay  
 Clay content: 35 to 50 percent  
 Rock fragments: 0 to 20 percent pebbles  
 Calcium carbonate equivalent: 5 to 15 percent  
 Electrical conductivity: 16 to 30 mmhos/cm  
 Sodium adsorption ratio: 18 to 70  
 Gypsum content: 1 to 5 percent  
 Reaction: pH 7.9 to 9.0

*Bnyz and Bnz horizons*

Hue: 2.5Y, 10YR, or 7.5YR  
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Clay loam, sandy clay loam, silty clay, clay, or silty clay loam  
 Clay content: 27 to 50 percent  
 Rock fragments: 0 to 20 percent pebbles  
 Calcium carbonate equivalent: 4 to 15 percent  
 Electrical conductivity: 16 to 30 mmhos/cm  
 Sodium adsorption ratio: 23 to 70  
 Gypsum content: 1 to 5 percent  
 Reaction: pH 7.9 to 9.0

**Note:** These horizons are slightly to violently effervescent; the lime is disseminated or in fine masses or threads; the gypsum, sodium sulfate, and other salts occur as few fine crystals to many fine masses; in some pedons, below 40 inches the soil is stratified with textures ranging from clay to loamy sand.

**26B—Absher clay, 0 to 4 percent slopes*****Setting***

Landform: Stream terraces  
 Slope: 0 to 4 percent

***Composition*****Major Components**

Absher and similar soils: 85 percent

**Minor Components**

Absher clay loam: 0 to 10 percent  
 Tinsley and similar soils: 0 to 5 percent

***Major Component Description***

Surface layer texture: Clay  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Moderately well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.1 inches

**261A—Absher-Nobe complex, 0 to 2 percent slopes*****Setting***

Landform: Absher—alluvial fans and stream terraces;  
 Nobe—alluvial fans and stream terraces  
 Position on landform: Absher—micro lows; Nobe—micro highs  
 Slope: Absher—0 to 2 percent; Nobe—0 to 2 percent

***Composition*****Major Components**

Absher and similar soils: 45 percent  
 Nobe and similar soils: 40 percent

**Minor Components**

Gerdrum and similar soils: 0 to 10 percent  
 Somewhat poorly drained soils: 0 to 5 percent

***Major Component Description*****Absher**

Surface layer texture: Clay  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Moderately well drained  
 Dominant parent material: Alluvium

Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.1 inches

### Nobe

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Moderately well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.0 inches

### Acel Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Till plains or small drainageways  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Mollic  
 Eutroboralfs

### Typical Pedon

Acel silty clay loam, 0 to 2 percent slopes, in a cropland area, 2,600 feet south and 2,280 feet west of the northeast corner of sec. 32, T. 32 N., R. 2 W.

Ap—0 to 5 inches; brownish gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, firm, sticky and plastic; few very fine and fine roots and tubular pores; neutral; abrupt smooth boundary.

Bt1—5 to 10 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine and fine roots and few fine pores; common distinct and prominent clay films on faces of peds and lining tubular pores; neutral; clear wavy boundary.

Bt2—10 to 22 inches; light brownish gray (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong medium and coarse subangular blocky structure; very hard, friable, sticky and

plastic; few fine roots and few very fine discontinuous pores; common distinct and prominent clay films on faces of peds and lining tubular pores; mildly alkaline; clear wavy boundary.

Bk1—22 to 36 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; very hard, friable, sticky and plastic; few fine roots and few very fine discontinuous pores; few fine irregularly shaped soft masses, filaments, and threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—36 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; very hard, friable, sticky and plastic; few fine roots and few very fine discontinuous pores; common fine irregularly shaped soft masses of lime on faces of peds; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Control section:* 5 to 22 inches

*Content of clay in the control section:* 40 to 55 percent

*Depth to Bk horizon:* 15 to 25 inches

**Classification note:** The Acel soil in Toole County is a taxadjunct to the series because of the dry value of 6 in the Ap horizon and it is outside the range of characteristics for the Mollic integrate; it classifies as a fine, montmorillonitic Typic Eutroboralf; these differences do not significantly affect use and management.

### Ap horizon

Hue: 2.5Y or 10YR

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

**Note:** This horizon is hard or very hard and massive when dry; some pedons have a thin E or transition horizon.

### Bt horizons

Hue: 2.5Y or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Silty clay or clay

Clay content: 40 to 55 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

**Note:** The darker color values typically do not extend below the Bt1 horizon; the Bt horizons have a COLE of more than 0.06.

**Bk horizons**

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam, silty clay loam, or silty clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles

Calcium carbonate equivalent: 1 to 15 percent

Reaction: pH 7.9 to 9.0

**Note:** Some pedons have a By or Bky horizon below 40 inches; some pedons do not have a Bk horizon.**23A—Acel silty clay loam, 0 to 2 percent slopes****Setting**

Landform: Till plains

Slope: 0 to 2 percent

**Composition****Major Components**

Acel and similar soils: 90 percent

**Minor Components**

Gerdrum and similar soils: 0 to 4 percent

Nishon and similar soils: 0 to 2 percent

Evanston and similar soils: 0 to 2 percent

Ferd and similar soils: 0 to 2 percent

**Major Component Description**

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.4 inches

**Assinniboine Series***Depth class:* Very deep (greater than 60 inches)*Drainage class:* Well drained*Permeability:* Moderate (0.6 to 2.0 inches/hour)*Landform:* Alluvial fans or stream terraces*Parent material:* Alluvium or eolian deposits*Slope range:* 0 to 8 percent*Annual precipitation:* 10 to 14 inches*Annual air temperature:* 42 to 45 degrees F*Frost-free period:* 105 to 125 days**Taxonomic Class:** Fine-loamy, mixed Aridic Argiborolls**Typical Pedon**

Assinniboine fine sandy loam, 0 to 4 percent slopes, in a cropland area, 2,500 feet south and 2,050 feet west of the northeast corner of sec. 2, T. 31 N., R. 1 W.

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, very dark brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots and pores; neutral; abrupt smooth boundary.

Bt—6 to 15 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; few very fine roots and pores; many faint clay films on faces of peds; neutral; clear smooth boundary.

Bk—15 to 30 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BC—30 to 60 inches; brown (10YR 5/3) fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, loose, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

**Range in Characteristics***Control section:* 6 to 15 inches*Mollic epipedon thickness:* 7 to 15 inches*Content of clay in the control section:* 18 to 27 percent*Depth to Bk horizon:* 14 to 25 inches**Ap horizon**

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Rock fragments: 0 to 25 percent pebbles

Clay content: 5 to 15 percent

Reaction: pH 6.1 to 7.8

**Bt horizon**

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Sandy clay loam or fine sandy loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

**Bk horizon**

Hue: 2.5Y or 10YR

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4  
 Texture: Sandy loam, fine sandy loam, or sandy clay loam  
 Clay content: 10 to 27 percent  
 Rock fragments: 0 to 15 percent pebbles  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 8.4  
**Note:** Some pedons have a Btk horizon.

*BC horizon*

Hue: 2.5Y or 10YR  
 Value: 5, 6, or 7 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Fine sandy loam, sandy loam, loamy fine sand, or fine sand, or stratifications of these textures  
 Clay content: 0 to 15 percent  
 Rock fragments: 0 to 15 percent pebbles  
 Reaction: pH 7.4 to 8.4

**35B—Assinniboine fine sandy loam, 0 to 4 percent slopes**

***Setting***

Landform: Alluvial fans and stream terraces  
 Slope: 0 to 4 percent

***Composition***

**Major Components**

Assinniboine and similar soils: 85 percent

**Minor Components**

Assinniboine sandy clay loam: 0 to 5 percent  
 Evanston and similar soils: 0 to 5 percent  
 Lihen and similar soils: 0 to 5 percent

***Major Component Description***

Surface layer texture: Fine sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 5.9 inches

**35C—Assinniboine fine sandy loam, 4 to 8 percent slopes**

***Setting***

Landform: Alluvial fans and stream terraces  
 Slope: 4 to 8 percent

***Composition***

**Major Components**

Assinniboine and similar soils: 85 percent

**Minor Components**

Assinniboine sandy clay loam: 0 to 5 percent  
 Evanston and similar soils: 0 to 5 percent  
 Lihen and similar soils: 0 to 5 percent

***Major Component Description***

Surface layer texture: Fine sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 5.9 inches

**Attewan Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour) to 27 inches; rapid below this depth (6.0 to 20.0 inches/hour)  
*Landform:* Relict stream terraces, outwash plains, or eskers  
*Parent material:* Alluvium  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls

***Typical Pedon***

Attewan sandy loam, 0 to 4 percent slopes, in a rangeland area, 300 feet south and 300 feet west of the northeast corner of sec. 9, T. 33 N., R. 2 E.

A—0 to 4 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine angular blocky structure parting to weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and many fine discontinuous pores; neutral; abrupt smooth boundary.

Bt1—4 to 7 inches; brown (10YR 5/3) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly



plastic; many fine roots and continuous pores; few faint clay films on faces of peds; neutral; gradual wavy boundary.

- Bt2**—7 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to strong medium subangular blocky structure; hard, firm, sticky and plastic; many fine and medium roots and many fine pores; common faint clay films on faces of peds; neutral; gradual wavy boundary.
- Bk1**—12 to 18 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots and pores; common medium soft masses and seams of lime; 10 percent pebbles; violently effervescent; strongly alkaline; gradual wavy boundary.
- Bk2**—18 to 27 inches; brown (10YR 5/3) gravelly sandy clay loam, very dark brown (10YR 4/2) moist; moderate medium angular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and medium roots and common fine pores; 20 percent pebbles; common medium soft masses and seams of lime; violently effervescent; strongly alkaline; abrupt wavy boundary.
- 2C**—27 to 60 inches; brown (10YR 5/3) very gravelly sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; 55 percent pebbles; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 4 to 12 inches  
*Mollic epipedon thickness:* 7 to 12 inches  
*Content of clay in the control section:* 20 to 35 percent  
*Depth to Bk horizon:* 10 to 21 inches  
*Depth to 2C horizon:* 20 to 40 inches

#### A horizon

Hue: 10YR or 2.5Y  
 Value: 4 or 5 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Texture: Loam or sandy loam  
 Clay content: 10 to 20 percent  
 Rock fragments: 0 to 50 percent—0 to 20 percent greater than 3-inch stones and cobbles, 0 to 30 percent less than 3-inch pebbles  
 Reaction: pH 6.1 to 7.3

#### Bt horizons

Hue: 10YR or 2.5Y  
 Value: 4, 5, or 6 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Clay loam, sandy clay loam, or loam

Clay content: 20 to 35 percent  
 Rock fragments: 0 to 25 percent—0 to 5 percent greater than 3-inch stones and cobbles, 0 to 20 percent less than 3-inch pebbles  
 Reaction: pH 6.6 to 7.8

#### Bk horizons

Hue: 10YR or 2.5Y  
 Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, 4, or 6  
 Texture: Loam, clay loam, silt loam, sandy clay loam, or sandy loam  
 Clay content: 15 to 30 percent  
 Rock fragments: 0 to 30 percent—0 to 5 percent stones and cobbles, 0 to 25 percent pebbles  
 Reaction: pH 7.4 to 9.0

#### 2C horizon

Hue: 2.5Y or 10YR  
 Value: 4, 5, or 6 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Loamy sand, sand, loamy coarse sand, or coarse sand  
 Clay content: 0 to 10 percent  
 Rock fragments: 35 to 75 percent—0 to 15 percent stones and cobbles, 35 to 60 percent pebbles  
 Reaction: pH 7.4 to 9.0

### 27B—Attewan loam, 0 to 4 percent slopes

#### Setting

Landform: Relict stream terraces  
 Slope: 0 to 4 percent

#### Composition

##### Major Components

Attewan and similar soils: 85 percent

##### Minor Components

Attewan sandy loam: 0 to 5 percent  
 Tinsley and similar soils: 0 to 5 percent  
 Evanston and similar soils: 0 to 5 percent

#### Major Component Description

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 4.9 inches

## 272B—Attewan sandy loam, 0 to 4 percent slopes

### Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

### Composition

#### Major Components

Attewan and similar soils: 85 percent

#### Minor Components

Degrad and similar soils: 0 to 5 percent

Tinsley and similar soils: 0 to 5 percent

Attewan sandy loam, calcareous: 0 to 5 percent

### Major Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

## 200F—Badland

### Composition

#### Major Components

Badland: 85 percent

#### Minor Components

Cabbart and similar soils: 0 to 5 percent

Hillon and similar soils: 0 to 10 percent

### Major Component Description

*Definition:* Steep or very steep, barren land dissected by many intermittent drainage channels

## Bascovy Series

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Permeability:* Very slow (less than 0.06 inch/hour)

*Landform:* Sedimentary plains or hills

*Parent material:* Residuum derived from shale

*Slope range:* 2 to 45 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Udorthentic Chromusterts

### Typical Pedon

Bascovy clay loam, 2 to 8 slopes, in a rangeland area, 1,800 feet north and 2,350 feet west of the southeast corner of sec. 30, T. 34 N., R. 1 W.

A—0 to 4 inches; light gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; moderate medium granular structure; hard, firm, sticky and plastic; many very fine roots and many fine pores; mildly alkaline; clear smooth boundary.

Bss1—4 to 13 inches; light gray (10YR 6/1) clay, gray (10YR 5/1) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots and pores; few slickensides intersecting at 45 degrees from the horizontal; mildly alkaline; gradual smooth boundary.

Bss2—13 to 21 inches; light gray (10YR 6/1) clay, gray (10YR 5/1) moist; weak fine subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; few slickensides intersecting at 45 degrees from the horizontal; mildly alkaline; gradual wavy boundary.

C—21 to 30 inches; light gray (10YR 6/1) clay, gray (10YR 5/1) moist; massive; hard, firm, very sticky and very plastic; few very fine roots; 20 percent soft shale chips; neutral; gradual wavy boundary.

Cr—30 to 60 inches; gray (10YR 6/1) and reddish yellow (7.5YR 6/8); hard platy shale; neutral.

### Range in Characteristics

*Control section:* 10 to 30 inches

*Content of clay in the control section:* 45 to 60 percent

*Depth to bedrock:* 20 to 40 inches

**Note:** Bascovy soils in Toole County are a taxadjunct to the Bascovy series by having chromas less than 2 derived from the shale parent material; they classify as Udorthentic Pellusterts; this does not affect use and management of the soil.

### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Texture: Clay or clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.6 to 8.4

### Bss horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Clay or silty clay  
 Clay content: 40 to 60 percent  
 Electrical conductivity: 0 to 4 mmhos/cm  
 Reaction: pH 6.1 to 8.4

*C horizon*

Hue: 10YR, 2.5Y, or 5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 1 or 2  
 Texture: Clay or silty clay  
 Clay content: 40 to 60  
 Electrical conductivity: 0 to 8 mmhos/cm  
 Reaction: 5.1 to 8.4

**Note:** Some pedons have a By horizon.

*Cr horizon*

Reaction: 5.1 to 8.4

**251C—Bascovy clay loam, 2 to 8 percent slopes**

***Setting***

Landform: Sedimentary plains  
 Slope: 2 to 8 percent

***Composition***

**Major Components**

Bascovy and similar soils: 85 percent

**Minor Components**

Neldore and similar soils: 0 to 5 percent  
 Marvan and similar soils: 0 to 5 percent  
 Bascovy clay: 0 to 5 percent

***Major Component Description***

Surface layer texture: Clay loam  
 Depth class: Moderately deep (20 to 40 inches)  
 Drainage class: Well drained  
 Dominant parent material: Shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 4.6 inches

**252D—Bascovy-Neldore clays, 8 to 15 percent slopes**

***Setting***

*Landforms:* Bascovy—hills; Neldore—hills  
*Position on landforms:* Bascovy—foot slopes;  
 Neldore—shoulders

Slope: Bascovy—8 to 15 percent; Neldore—8 to 15 percent

***Composition***

**Major Components**

Bascovy and similar soils: 50 percent  
 Neldore and similar soils: 35 percent

**Minor Components**

Marvan and similar soils: 0 to 5 percent  
 Soils that have slopes more than 15 percent:  
 0 to 5 percent  
 Rock outcrop: 0 to 5 percent

***Major Component Description***

**Bascovy**

Surface layer texture: Clay  
 Depth class: Moderately deep (20 to 40 inches)  
 Drainage class: Well drained  
 Dominant parent material: Shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 4.5 inches

**Neldore**

Surface layer texture: Clay  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 2.6 inches

**Bearpaw Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Till plains  
*Parent material:* Glacial till  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine, montmorillonitic Typic Argiborolls

**Typical Pedon**

Bearpaw clay loam, 0 to 4 percent slopes, in a cropland area, 1,300 feet north and 50 feet east of the southwest corner of sec. 20, T. 37 N., R. 4 W.

Ap—0 to 6 inches; grayish brown (2.5Y 4/2) clay loam, dark brown (10YR 3/3) moist; weak fine granular

structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; mildly alkaline; abrupt smooth boundary.

**Bt1**—6 to 13 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure; very hard, firm, sticky and plastic; common very fine roots and discontinuous pores; common distinct clay films on faces of peds; slightly effervescent; mildly alkaline; gradual smooth boundary.

**Bt2**—13 to 20 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common distinct clay films on faces of peds; slightly effervescent; mildly alkaline; gradual smooth boundary.

**Bk**—20 to 60 inches; light grayish brown (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common fine soft masses of lime; violently effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 6 to 20 inches

*Mollic epipedon thickness:* 7 to 12 inches

*Content of clay in the control section:* 35 to 50 percent

#### Ap horizon

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 6.1 to 7.8

#### Bt1 horizon

Value: 4 or 5 dry; 3 moist

Chroma: 2 or 3

Texture: Clay loam or loam

Clay content: 27 to 35 percent

Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.8

#### Bt2 horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 50 percent

Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

#### Bk horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam, silty clay loam, or clay

Clay content: 30 to 45 percent

Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

### 67B—Bearpaw clay loam, 0 to 4 percent slopes

#### Setting

Landform: Till plains

Slope: 0 to 4 percent

#### Composition

##### Major Components

Bearpaw and similar soils: 85 percent

##### Minor Components

Vida and similar soils: 0 to 2 percent

Nishon and similar soils: 0 to 2 percent

Daglum and similar soils: 0 to 3 percent

Vida clay loam, calcareous: 0 to 3 percent

Soils that have slopes more than 4 percent:  
0 to 5 percent

#### Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.7 inches

### 673B—Bearpaw-Daglum clay loams, 0 to 4 percent slopes

#### Setting

Landforms: Bearpaw—till plains; Daglum—till plains

Position on landform: Daglum—microlows

Slope: Bearpaw—2 to 4 percent; Daglum—0 to 2 percent

#### Composition

##### Major Components

Bearpaw and similar soils: 65 percent

Daglum and similar soils: 30 percent

### Minor Components

Vida and similar soils: 0 to 3 percent

Nishon and similar soils: 0 to 2 percent

### Major Component Description

#### Bearpaw

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.7 inches

#### Daglum

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 7.3 inches

### Benz Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landform:* Alluvial fans

*Parent material:* Alluvium

*Slope range:* 0 to 4 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed (calcareous),  
frigid Aridic Ustorthents

#### Typical Pedon

Benz clay loam, 0 to 4 percent slopes, in a rangeland area, 2,500 feet north and 1,800 feet west of the southeast corner of sec. 34, T. 36 N., R. 3 W.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—4 to 8 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; disseminated lime; slightly effervescent; mildly alkaline; clear smooth boundary.

C2—8 to 20 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots and few very fine pores; disseminated lime; few fine and medium soft masses of gypsum; slightly effervescent; moderately alkaline; gradual wavy boundary.

C3—20 to 30 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; disseminated lime; few fine and medium soft masses of gypsum and other salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

C4—30 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots and pores; common fine and medium soft masses of gypsum and other salts; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 18 to 35 percent

#### A horizon

Hue: 2.5Y or 10YR

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 0 to 13

Reaction: pH 7.4 to 9.6

#### C horizons

Hue: 5Y, 2.5Y, or 10YR

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam, clay loam, silt loam, or fine sandy loam

Clay content: 15 to 35 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 30

Calcium carbonate equivalent: 1 to 5 percent

Gypsum content: 1 to 2 percent

Reaction: pH 8.5 to 9.6

## 85B—Benz clay loam, 0 to 4 percent slopes

### Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

### Composition

#### Major Components

Benz and similar soils: 85 percent

#### Minor Components

Vanda and similar soils: 0 to 5 percent

Yamac and similar soils: 0 to 5 percent

Soils that have slopes more than 4 percent:  
0 to 5 percent

### Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.8 inches

### Bigsag Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Poorly drained

*Permeability:* Very slow (less than 0.06 inch/hour)

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic  
(calcareous), frigid Typic Halaquepts

### Typical Pedon

Bigasag silty clay, 0 to 2 percent slopes, in a rangeland area, 200 feet south and 800 feet west of the northeast corner of sec. 30, T. 35 N., R. 2 W.

A—0 to 2 inches; light gray (10YR 6/1) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, very sticky and very plastic; common very fine and

fine roots and pores; mildly alkaline; clear smooth boundary.

Byzg1—2 to 16 inches; light gray (2.5YR 6/1) silty clay, gray (2.5YR 5/1) moist; common medium brownish yellow (10YR 6/6) dry mottles; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine and fine roots and common fine pores; common masses of gypsum and soluble salts; strongly effervescent; mildly alkaline; clear smooth boundary.

Byzg2—16 to 60 inches; light gray (2.5YR 6/1) silty clay, gray (2.5YR 5/1) moist; few fine faint brownish yellow (10YR 6/6) dry mottles; massive; hard, firm, sticky and plastic; few very fine and fine roots and pores; common fine seams and masses of gypsum and soluble salts; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 60 percent

*Depth to seasonal high water table:* 18 to 36 inches during the period from December to June

#### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 1 or 2

Clay content: 35 to 60 percent

Electrical conductivity: Greater than 16 mmhos/cm

Sodium absorption ratio: 13 to 20

Reaction: pH 7.9 to 9.0

#### Byzg1 horizon

Hue: 2.5Y or 5Y

Chroma: 1 or 2

Mottles: Abundance—none to common; Hue—2.5Y; Value—5 dry; 4 moist

Chroma: 3 or 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 60 percent

Electrical conductivity: Greater than 16 mmhos/cm

Sodium absorption ratio: 13 to 40

Reaction: pH 8.4 to 9.0

#### Byzg2 horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Mottles: Abundance—common or many; Hue—2.5Y or 5Y; Value—5 dry, 4 moist; Chroma—3 or 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 60 percent



Electrical conductivity: Greater than 16 mmhos/cm  
 Sodium absorption ratio: 13 to 30, decreasing with depth  
 Reaction: pH 8.4 to 9.0

### **481A—Bigsag silty clay, 0 to 2 percent slopes**

#### ***Setting***

Landform: Flood plains  
 Slope: 0 to 2 percent

#### ***Composition***

##### **Major Components**

Bigsag and similar soils: 85 percent

##### **Minor Components**

Soils that are moderately saline: 0 to 10 percent  
 Soils that are somewhat poorly drained: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Silty clay  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Poorly drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Rare  
 Water table: Apparent  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 5.1 inches

### **Bigsandy Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Poorly drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents

#### ***Typical Pedon***

Bigsandy silty clay loam, 0 to 1 percent slope, in a rangeland area, 800 feet south and 1,200 feet east of the northwest corner of sec. 33, T. 36 N., R. 1 E.

Oi—4 inches to 0; partially decomposed roots from grasses and sedges.

A—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure parting to moderate fine granular structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg1—5 to 10 inches; gray (5Y 5/1) clay loam, dark gray (5Y 4/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg2—10 to 32 inches; light gray (5Y 6/1) clay loam, gray (5Y 5/1) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, sticky and plastic; few very fine and fine roots and few fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg3—32 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, sticky and plastic; strongly effervescent; moderately alkaline.

#### ***Range in Characteristics***

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 18 to 35 percent

*Depth to seasonal high water table:* 12 to 24 inches during the period from December to June

#### ***A horizon***

Hue: 2.5Y or 10YR  
 Value: 3 or 4 moist  
 Chroma: 1 or 2  
 Mottles: Abundance—none to few; Hue—2.5Y; Value—5 or 6 dry  
 Texture: Loam or silty clay loam  
 Clay content: 15 to 35 percent  
 Electrical conductivity: 2 to 25 mmhos/cm; saline phase 16 to 25 mmhos/cm  
 Reaction: pH 7.4 to 9.0  
**Note:** When mixed to 7 inches the epipedon has moist value of 4.

#### ***Cg1 horizon***

Hue: 5Y or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 1 or 2

Mottles: Abundance—common or many; Hue—2.5Y or 10YR; Value—5 or 6 dry; 4 or 5 moist; Chroma—4 or 6  
 Texture: Loam or silty clay loam consisting of strata of silt loam, clay loam, or fine sandy loam  
 Clay content: 18 to 35 percent  
 Electrical conductivity: 4 to 25 mmhos/cm; saline phase 16 to 25 mmhos/cm  
 Reaction: pH 7.9 to 9.0

*Cg2 horizon*

Hue: 5Y or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 1 or 2  
 Mottles: Abundance—common or many; Hue—2.5Y or 10YR; Value—5 or 6 dry; 4 or 5 moist; Chroma—4 or 6  
 Texture: Silt loam, silty clay loam, or clay loam consisting of strata of silt loam, fine sandy loam, fine sand, loamy sand, or clay  
 Clay content: 15 to 35 percent  
 Electrical conductivity: 8 to 25 mmhos/cm; saline phase 16 to 25 mmhos/cm  
 Reaction: pH 7.9 to 9.0

**144A—Bigsandy silty clay loam, 0 to 1 percent slopes**

***Setting***

Landform: Flood plains  
 Slope: 0 to 1 percent

***Composition***

**Major Components**

Bigsandy and similar soils: 85 percent

**Minor Components**

Savage and similar soils: 0 to 5 percent  
 Korchea and similar soils: 0 to 10 percent

***Major Component Description***

Surface layer texture: Silty clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Poorly drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Rare  
 Water table: Apparent  
 Available water capacity: 8.0 inches

**Blanchard Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Excessively drained  
*Permeability:* Rapid (6.0 to 20.0 inches/hour)  
*Landform:* Hills  
*Parent material:* Eolian deposits  
*Slope range:* 8 to 25 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Mixed, frigid Typic Ustipsamments

**Typical Pedon**

Blanchard loamy sand in an area of Lihen-Blanchard loamy sands, 8 to 25 percent slopes; in a rangeland area, 1,300 feet south and 1,400 feet west of the northeast corner of sec. 19, T. 36 N., R. 2 E.

- A—0 to 6 inches; brown (10YR 4/3) loamy sand, brown (10YR 3/3) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; mildly alkaline; clear smooth boundary.
- C1—6 to 20 inches; light brownish gray (10YR 6/2) loamy sand, dark brownish gray (10YR 4/2) moist; weak fine prismatic structure; soft, very friable, nonsticky and nonplastic; common very fine roots; strongly effervescent; mildly alkaline; clear smooth boundary.
- C2—20 to 36 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline; gradual wavy boundary.
- C3—36 to 60 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; mildly alkaline.

**Range in Characteristics**

*Control section:* 10 to 40 inches  
*Content of clay in the control section:* 0 to 5 percent  
**Note:** Some pedons have strata of coarser sands mainly below 36 inches.

***A horizon***

Hue: 7.5YR, 10YR, or 2.5Y  
 Value: 3, 4, 5, or 6 dry; 2, 3, or 4 moist  
 Chroma: 2 or 3  
 Clay content: 0 to 10 percent  
 Reaction: pH 5.6 to 7.8

*C horizons*

Hue: 7.5YR, 10YR, or 2.5Y  
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Fine sand, loamy sand, or loamy fine sand  
 Clay content: 0 to 5 percent  
 Reaction: pH 6.6 to 8.4

**Brockway Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderately slow (0.2 to 0.6 inches/hour)  
*Landform:* Alluvial fans  
*Parent material:* Loess or alluvium  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-silty, mixed, frigid  
 Calciorthidic Ustochrepts

**Typical Pedon**

Brockway silt loam, 2 to 4 percent slopes, in a cropland area, 2,200 feet south and 600 feet west of the northeast corner of sec. 33, T. 31 N., R. 1 W.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and tubular pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bk1—6 to 15 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium prismatic structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and continuous pores; violently effervescent; many medium and coarse coatings of lime on faces of peds; moderately alkaline; clear smooth boundary.

Bk2—15 to 38 inches; light gray (2.5Y 7/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium prismatic structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots and few very fine continuous pores; strongly effervescent; few fine irregularly shaped seams of lime; moderately alkaline; gradual wavy boundary.

C—38 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine and fine roots and few very fine continuous pores; slightly effervescent; moderately alkaline.

**Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 18 to 35 percent

*Depth to calcic horizon:* 6 to 20 inches

*Ap horizon*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Clay content: 18 to 27 percent

Rock fragments: 0 to 8 percent—0 to 4 percent stones, 0 to 4 percent cobbles  
 Reaction: pH 7.4 to 8.4

**Note:** In noncultivated areas the soils may have a thin A horizon 3 or 4 inches thick with color values of 4 or 5 dry and 3 moist.

*Bk1 horizon*

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Silt loam or loam  
 Clay content: 18 to 27 percent  
 Reaction: pH 7.4 to 8.4

*Bk2 horizon*

Hue: 10YR or 2.5Y  
 Value: 6, 7, or 8 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Silt loam or silty clay loam  
 Clay content: 18 to 35 percent  
 Calcium carbonate equivalent: 15 to 40 percent  
 Reaction: pH 7.9 to 9.0

*C horizon*

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 5 or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Very fine sandy loam, silt loam, or silty clay loam (some thin silty clay layers may occur in some pedons)  
 Clay content: 18 to 35 percent  
 Electrical conductivity: Less than 4 mmhos/cm  
 Calcium carbonate equivalent: 15 to 25 percent  
 Reaction: pH 7.9 to 9.0

#### **4B—Brockway silt loam, 2 to 4 percent slopes**

##### ***Setting***

Landform: Alluvial fans  
Slope: 2 to 4 percent

##### ***Composition***

##### **Major Components**

Brockway and similar soils: 85 percent

##### **Minor Components**

Kobar and similar soils: 0 to 10 percent  
Evanston and similar soils: 0 to 5 percent

##### ***Major Component Description***

Surface layer texture: Silt loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium or eolian material  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 10.3 inches

#### **4C—Brockway silt loam, 4 to 8 percent slopes**

##### ***Setting***

Landform: Alluvial fans  
Slope: 4 to 8 percent

##### ***Composition***

##### **Major Components**

Brockway and similar soils: 85 percent

##### **Minor Components**

Kobar and similar soils: 0 to 10 percent  
Evanston and similar soils: 0 to 5 percent

##### ***Major Component Description***

Surface layer texture: Silt loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium or eolian material  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 10.3 inches

#### **Busby Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid (2.0 to 6.0 inches/hour)  
*Landform:* Alluvial fans  
*Parent material:* Alluvium or eolian deposits  
*Slope range:* 2 to 15 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Coarse-loamy, mixed, frigid  
Aridic Ustochrepts

##### ***Typical Pedon***

Busby fine sandy loam, 2 to 8 percent slopes, in a cropland area, 1,200 feet north and 600 feet west of the southeast corner of sec. 27, T. 33 N., R. 3 W.

Ap—0 to 5 inches; grayish brown (10YR 5/3) fine sandy loam, brown 10YR 3/3) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and many very fine pores; neutral; abrupt smooth boundary.

Bw—5 to 13 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—13 to 24 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots and pores; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—24 to 32 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; single grain; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—32 to 60 inches; grayish brown (2.5Y 5/2) loamy sand, very dark grayish brown (2.5Y 3/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots and tubular pores; moderately alkaline.

**Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 10 to 18 percent

**Note:** Some pedons have a B<sub>ck</sub> horizon.

*Ap horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Clay content: 10 to 18 percent

Reaction: pH 7.4 to 8.4

**Note:** In some places the upper 3 inches of the soil has mollic colors but when mixed to 7 inches it does not meet the requirements for a mollic epipedon.

*Bw horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 10 to 18 percent

Effervescence: None to strongly

Reaction: pH 7.4 to 8.4

*Bk horizons*

Hue: 10YR, 2.5Y, or 5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam or sandy loam

Clay content: 10 to 18 percent

Effervescence: Strongly to violently

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

*C horizon*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, loamy fine sand, loamy sand, or fine sand (the loamy fine sand, loamy sand, or fine sand textures are below depths of 40 inches)

Clay content: 3 to 18 percent

Effervescence: Slightly to violently

Reaction: pH 7.9 to 8.4

**94C—Busby fine sandy loam, 2 to 8 percent slopes**

**Setting**

Landform: Alluvial fans

Slope: 2 to 8 percent

**Composition****Minor Components**

Busby and similar soils: 85 percent

**Major Components**

Yetull and similar soils: 0 to 10 percent

Yamac and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 6.9 inches

**94D—Busby fine sandy loam, 8 to 15 percent slopes**

**Setting**

Landform: Alluvial fans

Slope: 8 to 15 percent

**Composition****Major Components**

Busby and similar soils: 85 percent

**Minor Components**

Yamac and similar soils: 0 to 5 percent

Chinook and similar soils: 0 to 3 percent

Yetull and similar soils: 0 to 3 percent

Soils that have slopes more than 15 percent: 0 to 4 percent

**Major Component Description**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 6.9 inches

**942C—Busby-Chinook fine sandy loams, 2 to 8 percent slopes**

**Setting**

Landforms: Busby—alluvial fans; Chinook—alluvial fans

Slope: Busby—2 to 8 percent; Chinook—2 to 8 percent

### **Composition**

#### **Major Components**

Busby and similar soils: 50 percent  
Chinook and similar soils: 35 percent

#### **Minor Components**

Yamac and similar soils: 0 to 10 percent  
Yetull and similar soils: 0 to 5 percent

### **Major Component Description**

#### **Busby**

Surface layer texture: Fine sandy loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium or eolian material  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 6.9 inches

#### **Chinook**

Surface layer texture: Fine sandy loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium or eolian material  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 7.4 inches

#### **Cabba Series**

*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Sedimentary plains, hills, or escarpments  
*Parent material:* Residuum weathered from semiconsolidated interbedded sandstone and shale  
*Slope range:* 2 to 70 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents

### **Typical Pedon**

Cabba loam, in an area of Reeder-Cabba complex, 4 to 8 percent slopes; in a cropland area, 1,400 feet

south and 20 feet east of the northwest corner of sec. 28, T. 36 N., R. 4 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots and discontinuous pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.  
C—6 to 15 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure parting to weak medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and discontinuous pores; strongly effervescent; mildly alkaline; diffuse smooth boundary.  
Cr—15 to 60 inches; light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) semiconsolidated interbedded sandstone and shale.

### **Range in Characteristics**

*Control section:* 10 to 15 inches  
*Content of clay in the control section:* 20 to 35 percent  
*Depth to bedrock:* 10 to 20 inches

#### **Ap horizon**

Hue: 10YR or 2.5Y  
Value: 3, 4, 5, or 6 dry; 3 or 4 moist  
Chroma: 1, 2, 3, or 4  
Texture: Fine sandy loam, loam, or clay loam  
Clay content: 10 to 35 percent  
Electrical conductivity: 0 to 4 mmhos/cm  
Reaction: pH 7.4 to 9.0

#### **C horizon**

Hue: 10YR, 2.5Y, or 5Y  
Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist  
Chroma: 1, 2, 3, 4, or 6  
Texture: Loam, silt loam, clay loam, or silty clay loam  
Clay content: 20 to 35 percent  
Structure: Massive, thin platy, subangular blocky, or prismatic  
Rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles or channers  
Calcium carbonate equivalent: 2 to 15 percent  
Electrical conductivity: 0 to 8 mmhos/cm  
Effervescence: Slight to violently  
Reaction: pH 7.4 to 9.0

#### **Cr horizon**

**Note:** This horizon consists of interbedded layers

of silt, sand, and clay or a mixture of the three; they crush to loam, silt loam, very fine sandy loam, clay loam, or silty clay loam; some layers are harder than others, but all are considered rippable, or soft, and are readily dug with power tools.

Reaction: pH 7.4 to 8.4

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.5 inches

## **20C—Cabba loam, 4 to 8 percent slopes**

### ***Setting***

Landform: Sedimentary plains

Slope: 4 to 8 percent

### ***Composition***

#### **Major Components**

Cabba and similar soils: 85 percent

#### **Minor Components**

Macar and similar soils: 0 to 10 percent

Rock outcrop: 0 to 5 percent

### ***Major Component Description***

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.5 inches

## **20D—Cabba loam, 8 to 15 percent slopes**

### ***Setting***

Landform: Hills

Slope: 8 to 15 percent

### ***Composition***

#### **Major Components**

Cabba and similar soils: 85 percent

#### **Minor Components**

Macar and similar soils: 0 to 10 percent

Rock outcrop: 0 to 5 percent

### ***Major Component Description***

Surface layer texture: Loam

## **202F—Cabba-Dast fine sandy loams, 25 to 45 percent slopes**

### ***Setting***

Landforms: Cabba—hills; Dast—hills

Position on landform: Cabba—back slopes; Dast—foot slopes

Slope: Cabba—35 to 45 percent; Dast—25 to 35 percent

### ***Composition***

#### **Major Components**

Cabba and similar soils: 45 percent

Dast and similar soils: 40 percent

#### **Minor Components**

Doney and similar soils: 0 to 5 percent

Macar and similar soils: 0 to 5 percent

Soils that have slopes more than 45 percent: 0 to 5 percent

### ***Major Component Description***

#### **Cabba**

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.3 inches

#### **Dast**

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 3.8 inches



### 203E—Cabba-Doney clay loams, 8 to 25 percent slopes

#### *Setting*

Landforms: Cabba—hills; Doney—hills  
 Position on landform: Cabba—back slopes; Doney—foot slopes  
 Slope: Cabba—8 to 25 percent; Doney—8 to 25 percent

#### *Composition*

##### **Major Components**

Cabba and similar soils: 50 percent  
 Doney and similar soils: 35 percent

##### **Minor Components**

Macar and similar soils: 0 to 5 percent  
 Soils that have noncalcareous surface layers: 0 to 5 percent  
 Rock outcrop: 0 to 5 percent

#### *Major Component Description*

##### **Cabba**

Surface layer texture: Clay loam  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Interbedded sandstone and shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 2.4 inches

##### **Doney**

Surface layer texture: Clay loam  
 Depth class: Moderately deep (20 to 40 inches)  
 Drainage class: Well drained  
 Dominant parent material: Interbedded sandstone and shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 5.2 inches

### 201F—Cabba-Rock outcrop complex, 25 to 70 percent slopes

#### *Setting*

Landform: Hills  
 Position on landform: Back slopes (fig. 2)  
 Slope: 25 to 70 percent

#### *Composition*

##### **Major Components**

Cabba and similar soils: 60 percent  
 Rock outcrop, mudstone: 25 percent

##### **Minor Components**

Cabba clay loam: 0 to 5 percent  
 Doney and similar soils: 0 to 10 percent

#### *Major Component Description*

##### **Cabba**

Surface layer texture: Fine sandy loam  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Interbedded sandstone and shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 2.3 inches

##### **Rock outcrop, mudstone**

*Definition:* Surface exposures of mudstone

#### **Cabbart Series**

*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Hills or escarpments  
*Parent material:* Residuum weathered from semiconsolidated interbedded sandstone and shale  
*Slope range:* 15 to 70 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Loamy, mixed (calcareous), frigid shallow Aridic Ustorthents

#### **Typical Pedon**

Cabbart loam in an area of Cabbart-Delpoint loams, 8 to 25 percent slopes; in a rangeland area, 750 feet south and 1,700 feet west of the northeast corner of sec. 34, T. 36 N., R. 1 W.

A—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; slightly hard, friable, sticky and plastic; few very fine roots and discontinuous pores; strongly effervescent; moderately alkaline; clear wavy boundary.



Figure 2. Typical area of Cabba-Rock outcrop complex, 25 to 70 percent slopes.

Bk—4 to 16 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; strong medium platy structure; hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—16 to 60 inches; dark gray (10YR 4/1) semiconsolidated interbedded sandstone and shale, dark grayish brown (10YR 4/2) moist; strongly effervescent; mildly alkaline.

#### Range in Characteristics

*Control section:* 10 to 16 inches

*Content of clay in the control section:* 18 to 35 percent

*Depth to bedrock:* 10 to 20 inches

#### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or fine sandy loam

Clay content: 10 to 35 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

#### Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, silt loam, or silty clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 45 percent—0 to 15 percent hard pebbles, 0 to 45 percent soft pebbles

Electrical conductivity: 0 to 8 mmhos/cm

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.4 to 9.0

*Cr horizon*

Reaction: 7.4 to 8.4

**213E—Cabbart-Delpoint loams, 8 to 25 percent slopes*****Setting***

Landforms: Cabbart—hills; Delpoint—hills

Position on landform: Cabbart—shoulders; Delpoint—foot slopes

Slope: Cabbart—15 to 25 percent; Delpoint—8 to 15 percent

***Composition*****Major Components**

Cabbart and similar soils: 45 percent

Delpoint and similar soils: 40 percent

**Minor Components**

Fleak and similar soils: 0 to 5 percent

Yamac and similar soils: 0 to 5 percent

Rock outcrop: 0 to 5 percent

***Major Component Description*****Cabbart**

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.8 inches

**Delpoint**

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 3.9 inches

**212F—Cabbart-Hillon complex, 25 to 45 percent slopes*****Setting***

Landforms: Cabbart—hills; Hillon—hills (fig. 3)

Position on landform: Cabbart—back slopes; Hillon—shoulders

Slope: Cabbart—25 to 45 percent; Hillon—25 to 45 percent

***Composition*****Major Components**

Cabbart and similar soils: 45 percent

Hillon and similar soils: 40 percent

**Minor Components**

Yetull and similar soils: 0 to 10 percent

Rock outcrop: 0 to 5 percent

***Major Component Description*****Cabbart**

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.7 inches

**Hillon**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

**211F—Cabbart-Rock outcrop complex, 25 to 70 percent slopes*****Setting***

Landform: Hills

Position on landform: Back slopes

Slope: 25 to 70 percent

***Composition*****Major Components**

Cabbart and similar soils: 60 percent

Rock outcrop: 25 percent

**Minor Components**

Tinsley and similar soils: 0 to 10 percent

Fleak and similar soils: 0 to 5 percent



Figure 3. Typical area of Cabbart-Hillon complex, 25 to 40 percent slopes.

### **Major Component Description**

#### **Cabbart**

Surface layer texture: Fine sandy loam  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Interbedded sandstone and shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 2.7 inches

#### **Rock outcrop**

*Definition:* Surface exposures of bare bedrock

#### **Chinook Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid (2.0 to 6.0 inches/hour)

*Landform:* Alluvial fans or stream terraces  
*Parent material:* Alluvium or eolian deposits  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Coarse-loamy, mixed, Aridic Haploborolls

#### **Typical Pedon**

Chinook fine sandy loam, 0 to 8 percent slopes, in a cropland area, 100 feet north and 1,750 feet east of the southwest corner of sec. 9, T. 33 N., R. 3 E.

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; few very fine and fine roots and discontinuous pores; mildly alkaline; gradual smooth boundary.

**Bw1**—6 to 11 inches: brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots and pores; mildly alkaline; gradual wavy boundary.

**Bw2**—11 to 23 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots and pores; mildly alkaline; gradual wavy boundary.

**Bk**—23 to 60 inches; light yellowish brown (10YR 5/4) fine sandy loam, light olive brown (10YR 4/3) moist; moderate medium prismatic structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots and pores; few fine soft masses of lime; strongly effervescent; mildly alkaline.

#### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 7 to 15 inches

*Content of clay in the control section:* 5 to 18 percent

*Depth to Bk horizon:* 12 to 35 inches

#### **Ap horizon**

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loam

Clay content: 5 to 27 percent

Reaction: pH 6.6 to 8.4

#### **Bw horizons**

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent and more than 50 percent medium, fine, and coarser sand

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 9.0

#### **Bk horizon**

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 15 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

### **364C—Chinook fine sandy loam, 0 to 8 percent slopes**

#### **Setting**

Landform: Alluvial fans and stream terraces

Slope: 0 to 8 percent

#### **Composition**

##### **Major Components**

Chinook and similar soils: 85 percent

##### **Minor Components**

Soils that have slopes more than 8 percent: 0 to 5 percent

Lihen and similar soils: 0 to 2 percent

Kobar and similar soils: 0 to 3 percent

Kremlin and similar soils: 0 to 3 percent

Busby and similar soils: 0 to 2 percent

#### **Major Component Description**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 7.4 inches

### **36C—Chinook loam, 0 to 8 percent slopes**

#### **Setting**

Landform: Alluvial fans and stream terraces

Slope: 0 to 8 percent

#### **Composition**

##### **Major Components**

Chinook and similar soils: 85 percent

##### **Minor Components**

Lihen and similar soils: 0 to 10 percent

Trudau and similar soils: 0 to 5 percent

#### **Major Component Description**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 7.6 inches

## Cozberg Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderately rapid (2.0 to 6.0 inches/hour) to 30 inches; rapid below this depth (6.0 to 20.0 inches/hour)

*Landform:* Alluvial fans or hills

*Parent material:* Alluvium or eolian deposits

*Slope range:* 0 to 15 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Coarse-loamy, mixed Aridic Haploborolls

### Typical Pedon

Cozberg fine sandy loam in an area of Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes; in a cropland area, 200 feet south and 200 feet west of the northeast corner of sec. 14, T. 29 N., R. 1 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots and pores; mildly alkaline; abrupt smooth boundary.

Bw—8 to 18 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and few fine pores; mildly alkaline; gradual wavy boundary.

Bk—18 to 30 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 5/3) moist; weak coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine roots and pores; common fine soft masses of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

C—30 to 60 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; mildly alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 7 to 15 inches

*Content of clay in the control section:* 10 to 18 percent

*Depth to 2C horizon:* 20 to 40 inches

#### Ap horizon

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

#### Bw horizon

Value: 3 or 4 moist

Chroma: 2 or 3

Texture: Fine sandy loam, very fine sandy loam, or sandy loam

Clay content: 10 to 18 percent

Rock fragments: 0 to 15 percent

Reaction: pH 6.6 to 7.8

#### Bk horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Fine sandy loam, sandy loam, or very fine sandy loam

Clay content: 10 to 18 percent

Rock fragments: 0 to 15 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 6.6 to 7.8

#### 2C horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loamy sand, sand, loamy coarse sand, or coarse sand

Clay content: 0 to 10 percent

Rock fragments: 0 to 35 percent pebbles

Reaction: pH 7.4 to 8.4

### 45C—Cozberg fine sandy loam, 2 to 8 percent slopes

#### Setting

Landform: Alluvial fans

Slope: 2 to 8 percent

***Composition*****Major Components**

Cozberg and similar soils: 85 percent

**Minor Components**

Cozberg fine sandy loam, calc.: 0 to 5 percent

Degrad and similar soils: 0 to 5 percent

Kremlin and similar soils: 0 to 5 percent

***Major Component Description***

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

**45D—Cozberg fine sandy loam, 8 to 15 percent slopes*****Setting***

Landform: Hills

Slope: 8 to 15 percent

***Composition*****Major Components**

Cozberg and similar soils: 85 percent

**Minor Components**

Degrad and similar soils: 0 to 5 percent

Lihen and similar soils: 0 to 5 percent

Soils that have slopes more than 15 percent:  
0 to 5 percent

***Major Component Description***

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

**451A—Cozberg-Lihen fine sandy loams, 0 to 2 percent slopes*****Setting***

Landforms: Cozberg—alluvial fans; Lihen—alluvial fans

Slope: Cozberg—0 to 2 percent; Lihen—0 to 2 percent

***Composition*****Major Components**

Cozberg and similar soils: 50 percent

Lihen and similar soils: 35 percent

**Minor Components**

Kremlin and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

***Major Component Description*****Cozberg**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

**Lihen**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.5 inches

**451C—Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes*****Setting***

Landforms: Cozberg—alluvial fans; Lihen—alluvial fans

Slope: Cozberg—2 to 8 percent; Lihen—2 to 8 percent

## **Composition**

### **Major Components**

Cozberg and similar soils: 50 percent

Lihen and similar soils: 35 percent

### **Minor Components**

Kremlin and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

## **Major Component Description**

### **Cozberg**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

### **Lihen**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.5 inches

### **Creed Series**

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landform:* Alluvial fans or stream terraces

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Typic Natriboralfs

### **Typical Pedon**

Creed clay loam in an area of Creed-Gerdrum-Absher complex, 0 to 4 percent slopes; in a rangeland area, 2,000 east and 1,800 north of the southwest corner of sec. 17, T. 32 N., R. 1 E.

**E**—0 to 5 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak thin platy structure; slightly hard, friable, sticky and plastic; many very fine roots; mildly alkaline; abrupt smooth boundary.

**Btn**—5 to 12 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; strong medium columnar structure; very hard, firm, very sticky and plastic; few very fine roots and discontinuous pores; common faint clay films on faces of pedis; mildly alkaline; clear smooth boundary.

**Bkn**—12 to 24 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**Bknz**—24 to 33 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common medium soft masses of lime; common fine seams of salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

**Bknyz**—33 to 60 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse angular blocky structure; hard, firm, sticky and plastic; few fine soft masses of lime; common fine and medium seams and soft masses of gypsum and other salts; strongly effervescent; moderately alkaline.

### **Range in Characteristics**

*Control section:* 5 to 12 inches

*Content of clay in the control section:* 25 to 55 percent

*Depth to the Bkn horizon:* 10 to 20 inches

*Depth to the Bknyz horizon:* 22 to 36 inches

**Note:** Some pedons do not have a Bknyz horizon but have a Bkny, Bny, Bnz, Bknz, or C horizon.

### **E horizon**

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Reaction: pH 6.1 to 8.4



*Btn horizon*

Hue: 10YR, 2.5Y, or 5Y  
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist  
 Chroma: 2 or 3  
 Texture: Clay loam, silty clay loam, clay, or silty clay  
 Clay content: 35 to 55 percent  
 Electrical conductivity: 4 to 8 mmhos/cm; sandy substratum phase is 0 to 2 mmhos/cm  
 Sodium absorption ratio: 8 to 20, pedons with SARs less than 13 have more exchangeable magnesium plus sodium than calcium plus exchangeable acidity at pH 8.2  
 Reaction: pH 6.6 to 9.0

*Bkn, Bknz, Bknyz horizons*

Hue: 10YR, 2.5Y, or 5Y  
 Value: 4, 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Silty clay loam, clay loam, sandy clay loam, loam, or clay  
 Clay content: 25 to 45 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Electrical conductivity: 4 to 8 mmhos/cm  
 Sodium absorption ratio: 13 to 20  
 Gypsum: 0 to 2 percent  
 Reaction: pH 7.9 to 9.0

### **311B—Creed-Gerdrum-Absher complex, 0 to 4 percent slopes**

#### ***Setting***

Landforms: Creed—alluvial fans and stream terraces;  
 Gerdrum—alluvial fans and stream terraces;  
 Absher—alluvial fans and stream terraces  
 Position on landform: Creed—microhighs; Gerdrum—microlows; Absher—microlows  
 Slope: Creed—0 to 4 percent; Gerdrum—0 to 4 percent; Absher—0 to 4 percent

#### ***Composition***

##### **Major Components**

Creed and similar soils: 35 percent  
 Gerdrum and similar soils: 30 percent  
 Absher and similar soils: 20 percent

##### **Minor Components**

Ethridge and similar soils: 0 to 5 percent  
 Evanston and similar soils: 0 to 5 percent  
 Ferd and similar soils: 0 to 5 percent

### ***Major Component Description***

#### **Creed**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 6.4 inches

#### **Gerdrum**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.8 inches

#### **Absher**

Surface layer texture: Clay  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Moderately well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.1 inches

### **Daglum Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Till plains  
*Parent material:* Glacial till  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 15 to 19 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine, montmorillonitic Vertic  
 Natriborolls

#### **Typical Pedon**

Daglum clay loam in an area of Bearpaw-Daglum clay loams, 0 to 4 percent slopes; in a rangeland area,

1,800 feet south and 300 feet west of the northeast corner of sec. 12, T. 37 N., R. 3 E.

**A**—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and common very fine tubular pores; neutral; abrupt smooth boundary.

**E**—6 to 9 inches; light brownish gray (10YR 6/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and common very fine tubular pores; neutral; abrupt smooth boundary.

**Btn1**—9 to 14 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong fine and medium columnar structure parting to strong fine and medium angular blocky structure; extremely hard, very firm, very sticky and plastic; common very fine roots and vesicular pores; common faint clay films on faces of peds; moderately alkaline; clear smooth boundary.

**Btn2**—14 to 19 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong fine and medium prismatic structure parting to strong fine and medium angular blocky structure; extremely hard, very firm, very sticky and plastic; common very fine roots and tubular and vesicular pores; common faint clay films on faces of peds; moderately alkaline; gradual smooth boundary.

**Bkn**—19 to 35 inches; dark grayish brown (2.5Y 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine prismatic structure parting to weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots and tubular pores; many medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**C**—35 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 9 to 19 inches

*Mollic epipedon thickness:* 7 to 16 inches

*Content of clay in the control section:* 35 to 60 percent

*Depth to Bk horizon:* 12 to 32 inches

**Note:** Soft sedimentary beds of shale, siltstone, or fine grained sandstone are below depths of 60 inches in some pedons.

#### A horizon

Hue: 10YR

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2

Reaction: pH 5.6 to 7.3

#### E horizon

Hue: 10YR or 2.5Y

Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1 or 2

Texture: Fine sandy loam, loam, silt loam, clay loam, or silty clay loam

Reaction: pH 5.6 to 7.3

**Note:** In some tilled pedons all of the E horizon has been mixed with the Ap horizon.

#### Btn horizons

Hue: 10YR or 2.5Y

Value: 3, 4, 5, or 6 dry; 2, 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, silty clay loam, or clay loam

Clay content: 35 to 60 percent

Structure: Strong columnar structure in the upper part grading to moderate or strong prismatic and blocky in the lower part

Reaction: pH 6.1 to 8.4 in the upper part; pH 7.9 to 9.0 in the lower part

**Note:** Some pedons have gypsum accumulation in the B and C horizons.

#### Bkn and C horizons

Hue: 2.5Y or 5Y

Value: 4, 5, 6, or 7 dry; 3, 4, 5, or 6 moist

Chroma: 1, 2, 3, or 4

Texture: Clay loam, silty clay, silty clay loam, or clay; is stratified in some pedons; texture of loam is allowed below a depth of 40 inches

Reaction: pH 7.4 to 9.0

#### Dast Series

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Permeability:* Moderately rapid (2.0 to 6.0 inches/hour)

*Landform:* Hills

*Parent material:* Residuum weathered from semiconsolidated sandstone

*Slope range:* 25 to 45 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free season:* 90 to 105 days

**Taxonomic Class:** Coarse-loamy, mixed, frigid Typic Ustochrepts

### Typical Pedon

Dast fine sandy loam in an area of Cabba-Dast fine sandy loams, 25 to 45 percent slopes, in rangeland, 1,900 feet south and 2,300 feet west of the northeast corner of sec. 30, T. 35 N., R. 4 W.

A—0 to 5 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine pores; violently effervescent; mildly alkaline; clear smooth boundary.

Bw—5 to 15 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; weak medium prismatic structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine pores; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—15 to 30 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; few fine soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—30 to 60 inches; light gray (5Y 7/2) semiconsolidated sandstone, brown (10YR 5/3) moist; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 30 inches

*Content of clay in the control section:* 2 to 18 percent

*Depth to semiconsolidated bedrock:* 20 to 40 inches

*Depth to Bk horizon:* 13 to 24 inches

#### A horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

#### Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles  
Reaction: pH 7.4 to 8.4

#### Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### Cr horizon

Reaction: pH 7.4 to 8.4

## Degrad Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour) to 24 inches; rapid below this depth (6.0 to 20.0 inches/hour)

*Landform:* Relict stream terraces

*Parent material:* Alluvium

*Slope range:* 0 to 4 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls

### Typical Pedon

Degrad loam, 0 to 4 percent slopes, in a cropland area, 1,800 feet south and 1,400 feet west of the northeast corner of sec. 4, T. 34 N., R. 3 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and many fine discontinuous pores; neutral; abrupt smooth boundary.

Bt—5 to 14 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; strong fine prismatic structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and common fine tubular pores; few faint clay films on faces of peds; mildly alkaline; abrupt smooth boundary.

Bk—14 to 24 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist;

moderate fine and medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots and tubular pores; common medium soft masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

**C**—24 to 60 inches; light grayish brown (2.5Y 6/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline.

#### Range in Characteristics

*Control section:* 5 to 40 inches

*Mollic epipedon thickness:* 10 to 16 inches

*Depth to Bk horizon:* 12 to 23 inches

*Depth to 2C horizon:* 20 to 40 inches

#### Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Sandy loam or loam

Clay content: 10 to 20 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

**Note:** Some pedons have an A horizon below the Ap horizon; thin surface horizons of 2 to 4 inches thick having a dry value of 4 are allowed; these horizons when mixed to 7 inches have a dry value of 5.

#### Bt horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam or sandy clay loam

Clay content: 20 to 35 percent (sand content 35 to 55 percent)

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

#### Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Sandy clay loam, loam, or clay loam

Clay content: 15 to 30 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: Less than 4 mmhos/cm

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.4 to 9.0

#### 2C horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Sand, coarse sand, fine sand, or loamy sand

Clay content: 0 to 5 percent

Rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.9 to 8.4

### 16B—Degrand loam, 0 to 4 percent slopes

#### Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

#### Composition

##### Major Components

Degrad and similar soils: 85 percent

##### Minor Components

Soils that have slopes more than 4 percent: 0 to 10 percent

Degrad sandy loam: 0 to 5 percent

#### Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.9 inches

### 162B—Degrand sandy loam, 0 to 4 percent slopes

#### Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

#### Composition

##### Major Components

Degrad and similar soils: 85 percent

### Minor Components

Lihen and similar soils: 0 to 7 percent  
 McKenzie and similar soils: 0 to 1 percent  
 Marmarth and similar soils: 0 to 7 percent

### Major Component Description

Surface layer texture: Sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 4.7 inches

### Delpoint Series

*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Sills or escarpments  
*Parent material:* Residuum weathered from semiconsolidated interbedded sandstone and shale  
*Slope range:* 8 to 35 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed, frigid Aridic Ustochrepts

### Typical Pedon

Delpoint loam in an area of Cabbart-Delpoint loams, 8 to 25 percent slopes; in a rangeland area, 2,300 feet north and 2,100 feet east of the southwest corner of sec. 30, T. 34 N., R. 2 W.

- A—0 to 2 inches; grayish brown (10YR 5/2) loam, dark grayish brown (2.5YR 4/2) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots and many fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bw—2 to 11 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots and pores; strongly effervescent; strongly alkaline; clear wavy boundary.
- Bk—11 to 24 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak

coarse prismatic structure; hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots and many fine and very fine pores; many medium irregularly shaped soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—24 to 60 inches; gray (2.5Y 6/1) interbedded semiconsolidated sandstone and shale.

### Range in Characteristics

*Control section:* 10 to 24 inches  
*Content of clay in the control section:* 18 to 35 percent  
*Depth to semiconsolidated bedrock:* 20 to 40 inches  
*Depth to Bk horizon:* 10 to 20 inches

#### A horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 3, 4, or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Loam or clay loam  
 Clay content: 20 to 35 percent  
 Rock fragments: 0 to 5 percent pebbles  
 Reaction: pH 7.4 to 8.4  
**Note:** When mixed to 7 inches the surface will not meet the requirements for a mollic epipedon.

#### Bw horizon

Hue: 10YR, 2.5Y, or 5Y  
 Value: 5, 6, or 7 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Loam, clay loam, or silty clay loam  
 Clay content: 18 to 35 percent clay  
 Rock fragments: 0 to 15 percent pebbles  
 Effervescence: None to violently  
 Reaction: pH 6.6 to 9.0

#### Bk horizon

Hue: 10YR, 2.5Y, or 5Y  
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Loam, sandy loam, clay loam, or silty clay loam  
 Clay content: 18 to 35 percent clay  
 Rock fragments: 0 to 15 percent pebbles  
 Calcium carbonate equivalent: 5 to 30 percent; there is not more than a 5 percent difference in calcium carbonate equivalent or by volume of secondary carbonates in the underlying horizon of material  
 to meet the requirements of a calcic horizon  
 Effervescence: Strongly or violently  
 Reaction: pH 7.9 to 9.0

#### Cr horizon

Reaction: pH 7.9 to 9.0

## 171F—Delpoint-Cabbart clay loams, 25 to 60 percent slopes

### Setting

Landforms: Delpoint—hills; Cabbart—hills  
 Position on landform: Delpoint—foot slopes;  
 Cabbart—back slopes  
 Slope: Delpoint—25 to 35 percent; Cabbart—25 to 60 percent

### Composition

#### Major Components

Delpoint and similar soils: 50 percent  
 Cabbart and similar soils: 35 percent

#### Minor Components

Fleak and similar soils: 0 to 10 percent  
 Rock outcrop: 0 to 5 percent

### Major Component Description

#### Delpoint

Surface layer texture: Clay loam  
 Depth class: Moderately deep (20 to 40 inches)  
 Drainage class: Well drained  
 Dominant parent material: Interbedded sandstone and shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 3.8 inches

#### Cabbart

Surface layer texture: Clay loam  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Interbedded sandstone and shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 2.7 inches

## DA—Denied access

### Composition

#### Major Components

Denied access: 100 percent

### Major Component Description

**Definition:** Areas where mapping access was denied by landowner

## Doney Series

**Depth class:** Moderately deep (20 to 40 inches)

**Drainage class:** Well drained

**Permeability:** Moderate (0.6 to 2.0 inches/hour)

**Landform:** Hills

**Parent material:** Residuum weathered from semiconsolidated interbedded sandstone and shale

**Slope range:** 4 to 25 percent

**Annual precipitation:** 13 to 17 inches

**Annual air temperature:** 41 to 44 degrees F

**Frost-free period:** 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed, frigid Typic Ustochrepts

### Typical Pedon

Doney clay loam in an area of Doney-Cabba complex, 4 to 15 percent slopes; in a rangeland area, 850 feet south and 1,100 feet east of the northwest corner of sec. 18, T. 35 N., R. 4 W.

A—0 to 5 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; few very fine roots and pores; strongly effervescent; mildly alkaline; clear smooth boundary.

Bw—5 to 18 inches; light gray (2.5Y 7/2) loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—18 to 32 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—32 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated interbedded sandstone and shale, grayish brown (10YR 5/2) moist; strongly effervescent; moderately alkaline.

### Range in Characteristics

**Control section:** 10 to 32 inches

**Content of clay in the control section:** 18 to 30 percent

**Depth to semiconsolidated bedrock:** 20 to 40 inches

*A horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 8.4

**Note:** Uncultivated areas have a thin A horizon with a value of 5 or 6 dry; 3, 4, or 5 moist; chroma is 1, 2, or 3.

*Bw horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 35 percent—0 to 10 percent cobbles, 0 to 25 percent pebbles

Calcium carbonate equivalent: Less than 15 percent

Reaction: pH 7.9 to 9.0

*Bk horizon*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 30 percent—0 to 10 percent cobbles, 0 to 20 percent pebbles and channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

*Cr horizon*

Material: Semiconsolidated interbedded sandy and silty sedimentary beds

Reaction: pH 7.9 to 9.0

## 181D—Doney-Cabba complex, 4 to 15 percent slopes

### Setting

Landforms: Doney—hills; Cabba—hills

Position on landform: Doney—back slopes;

Cabba—shoulders

Slope: Doney—4 to 15 percent; Cabba—4 to 15 percent

### Composition

#### Major Components

Doney and similar soils: 55 percent

Cabba and similar soils: 30 percent

#### Minor Components

Soils that have noncalcareous surface layers: 0 to 5 percent

Dust and similar soils: 0 to 5 percent

Rock outcrop: 0 to 5 percent

### Major Component Description

#### Doney

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.2 inches

#### Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.5 inches

### Elloam Series

*Depth class:* Very deep (greater than 60 inches)*Drainage class:* Well drained*Permeability:* Very slow (less than 0.06 inch/hour)*Landform:* Till plains*Parent material:* Glacial till*Slope range:* 0 to 8 percent*Annual precipitation:* 10 to 14 inches*Annual air temperature:* 42 to 45 degrees F*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Typic Natriboralfs

#### Typical Pedon

Elloam clay loam in an area of Kevin-Elloam clay loams, 2 to 8 percent slopes; in a cropland area, 1,100 feet north and 600 feet east of the southwest corner of sec. 18, T. 32 N., R. 1 W.

E—0 to 4 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 4/3) moist; moderate medium platy structure parting to moderate fine and medium granular structure; hard, very firm, sticky

and plastic; many very fine and fine roots and pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

**Btn1**—4 to 11 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; strong medium columnar structure parting to strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; many fine roots and many very fine and fine pores; many distinct clay films on faces of peds and lining pores; slightly effervescent; mildly alkaline; clear wavy boundary.

**Btn2**—11 to 15 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; many fine roots and many very fine and fine pores; many distinct clay films on faces of peds and lining pores; slightly effervescent; mildly alkaline; clear wavy boundary.

**Btkn**—15 to 24 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky structure; hard, firm, sticky and plastic; common distinct clay films on faces of peds and lining pores; few fine and medium soft masses of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

**Bknyz**—24 to 35 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine roots and pores; few medium soft masses of lime; many medium filaments and soft masses of gypsum and other salts; strongly effervescent; mildly alkaline; clear wavy boundary.

**Bnyz**—35 to 60 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; massive; hard, very firm, very sticky and very plastic; common medium nests of gypsum and other salts; strongly effervescent; mildly alkaline.

#### Range in Characteristics

*Control section:* 4 to 25 inches

*Content of clay in the control section:* 35 to 55 percent

*Depth to the Btkn horizon:* 8 to 18 inches

*Depth to the Bknyz horizon:* 12 to 24 inches

#### E horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 30 to 45 percent where mixed to 7 inches and textures are clay loam or clay

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.1 to 7.8

**Note:** The surface layer is crusted in the natural state and is also crusted where cultivated.

#### Btn horizons

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 55 percent

Structure: Strong or medium columnar, prismatic, or blocky

Rock fragments: 0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles

Sodium absorption ratio: 8 to 25

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 6.6 to 9.0

**Note:** Pedons that have less than 15 percent ESP have more exchangeable Mg plus sodium than calcium, plus exchange acidity at pH 8.2.

#### Btkn horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 30 to 45 percent

Rock fragments: 0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles

Sodium absorption ratio: 13 to 25

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

#### Bknyz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Loam or clay loam

Clay content: 25 to 40 percent

Rock fragments: 0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles

Sodium absorption ratio: 13 to 25

Electrical conductivity: 8 to 16 mmhos/cm

Reaction: pH 7.9 to 9.0

#### Bnyz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Loam or clay loam

Clay content: 25 to 40 percent

Rock fragments: 0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles

Sodium absorption ratio: 13 to 25



Electrical conductivity: 8 to 16 mmhos/cm  
Bulk density: 1.7 to 1.9 grams/cc  
Reaction: pH 7.9 to 9.0

## **521B—Elloam-Absher clay loams, 0 to 4 percent slopes**

### ***Setting***

Landforms: Elloam—till plains; Absher—till plains  
Position on landform: Elloam—microhighs; Absher—microlows  
Slope: Elloam—0 to 4 percent; Absher—0 to 4 percent

### ***Composition***

#### **Major Components**

Elloam and similar soils: 50 percent  
Absher and similar soils: 40 percent

#### **Minor Components**

Phillips and similar soils: 0 to 5 percent  
Slickspots: 0 to 5 percent

### ***Major Component Description***

#### **Elloam**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Salt affected: Saline within 30 inches  
Sodium affected: Sodic within 30 inches  
Available water capacity: 6.6 inches

#### **Absher**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Moderately well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Salt affected: Saline within 30 inches  
Sodium affected: Sodic within 30 inches  
Available water capacity: 4.3 inches

#### **Enbar Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed Cumulic Haploborolls

### **Typical Pedon**

Enbar loam in an area of Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes; in a rangeland area, 2,300 feet north and 1,000 feet east of the southwest corner of sec. 18, T. 37 N., R. 3 E.

- A1—0 to 6 inches; dark yellowish brown (10YR 4/4) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots and many very fine and fine pores; neutral; abrupt smooth boundary.
- A2—6 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure; slightly hard, friable, sticky and plastic; many very fine and few coarse roots and many very fine and fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- C—18 to 30 inches; very dark grayish brown (10YR 3/2) clay loam black (10YR 2/1) moist; moderate medium prismatic structure; hard, firm, sticky and plastic; many very fine roots and common very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.
- Cg1—30 to 42 inches; gray (10YR 5/1) loam, dark gray (10YR 4/1) moist; common fine faint reddish yellow (7.5YR 6/6) mottles; weak medium subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine roots and pores; strongly effervescent; moderately alkaline; gradual wavy boundary.
- Cg2—42 to 50 inches; light gray (10YR 6/1) loam, dark gray (10YR 4/1) moist; common fine distinct strong brown (7.5YR 5/6) mottles; massive; soft, friable, slightly sticky and slightly plastic; 5 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.
- 2C—50 to 60 inches; grayish brown (10YR 5/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; common fine prominent yellowish brown (10YR 5/8) mottles; single grain; soft, friable, slightly sticky and slightly plastic;

35 percent pebbles and 5 percent cobbles; slightly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 16 to 28 inches

*Content of clay in the control section:* 18 to 30 percent

*Depth to seasonal water table:* 30 to 60 inches

*Depth to 2C horizon:* 40 to 60 inches

#### A horizons

Hue: 5YR, 7.5YR, or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1, 2, 4, or 6

Clay content: 18 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

#### C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Mottles: Abundance—few to common; Hue—10YR 5/4 or 10YR 4/4

Texture: Loam or clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: Strongly or violently

Reaction: pH 7.9 to 8.4

#### Cg horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 0, 1, or 2

Mottles: Abundance—few to common; Hue—10YR 3/4, 10YR 5/6, or 10YR 6/6

Texture: Loam with stratification of sandy loam, silty clay loam, or clay loam

Clay content: 18 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: Strongly or violently

Reaction: pH 7.9 to 8.4

#### 2C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Mottles: Abundance—few to common; Hue—10YR 6/6 or 10YR 5/6

Texture: Sandy loam or loamy sand

Clay content: 5 to 18 percent

Rock fragments: 35 to 75 percent—0 to 5 percent cobbles, 35 to 70 percent pebbles

Effervescence: Strongly or violently

Reaction: pH 7.9 to 8.4

**Note:** Some pedons do not have a 2C horizon.

### 831B—Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes

#### Setting

Landforms: Enbar—flood plains; Bigsandy—flood plains; Korchea—flood plains

Slope: Enbar—0 to 4 percent; Bigsandy—0 to 2 percent; Korchea—0 to 4 percent

#### Composition

##### Major Components

Enbar and similar soils: 35 percent

Bigsandy and similar soils: 30 percent

Korchea and similar soils: 25 percent

##### Minor Components

Kiwanis and similar soils: 0 to 4 percent

Soils that are clayey: 0 to 3 percent

Soils that are frequently flooded: 0 to 3 percent

#### Major Component Description

##### Enbar

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: 8.7 inches

##### Bigsandy

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: 8.0 inches

##### Korchea

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare  
Available water capacity: 10.3 inches

## Ethridge Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Alluvial fans, stream terraces, and small drainageways  
*Parent material:* Alluvium  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Aridic Argiborolls

### Typical Pedon

Ethridge silty clay loam, 0 to 4 percent slopes, in a cropland area, 2,100 feet south and 20 feet west of the northeast corner of sec. 6, T. 30 N., R. 2 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and discontinuous pores; neutral; abrupt smooth boundary.

Bt—6 to 15 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong medium subangular blocky structure; very hard, firm, sticky and very plastic; many very fine and fine roots and common very fine and fine discontinuous pores; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Bk1—15 to 27 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine roots and many very fine discontinuous pores; few fine soft masses and filaments of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—27 to 38 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—38 to 60 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; few fine roots; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 6 to 15 inches  
*Mollic epipedon thickness:* 7 to 16 inches  
*Content of clay in the control section:* 35 to 45 percent  
*Depth to Bk horizon:* 10 to 20 inches

#### Ap horizon

Hue: 10YR or 2.5Y  
Value: 2 or 3 moist  
Chroma: 2 or 3  
Texture: Clay loam or silty clay loam  
Clay content: 20 to 35 percent  
Rock fragments: 0 to 5 percent pebbles  
Reaction: pH 6.1 to 7.8

#### Bt horizon

Hue: 10YR or 2.5Y  
Value: 3 or 4 moist  
Chroma: 2, 3, or 4  
Texture: Clay, silty clay, clay loam, or silty clay loam  
Clay content: 35 to 45 percent  
Rock fragments: 0 to 5 percent pebbles  
Reaction: pH 6.6 to 8.4

#### Bk horizons

Hue: 10YR or 2.5Y  
Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
Chroma: 2, 3, or 4  
Texture: Clay, silty clay loam, loam, clay loam, or silty clay  
Clay content: 25 to 45 percent  
Rock fragments: 0 to 5 percent pebbles  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.4 to 9.0

#### BC horizon

Hue: 10YR or 2.5Y  
Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
Chroma: 2, 3, or 4  
Texture: Clay loam, silt loam, or silty clay loam (these textures consist of strata of finer and coarser materials)  
Clay content: 25 to 40 percent slopes  
Rock fragments: 0 to 5 percent  
Electrical conductivity: 0 to 4 mmhos/cm  
Gypsum: 0 to 3 percent  
Reaction: pH 7.4 to 8.4

**Note:** Some pedons this horizon may be stratified.

**38B—Ethridge clay loam, 0 to 4 percent slopes*****Setting***

Landform: Alluvial fans, stream terraces, and drainageways  
Slope: 0 to 4 percent

***Composition*****Major Components**

Ethridge and similar soils: 85 percent

**Minor Components**

Marias and similar soils: 0 to 5 percent  
Marvan and similar soils: 0 to 5 percent  
Vanda and similar soils: 0 to 5 percent

***Major Component Description***

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

**384B—Ethridge silty clay loam, 0 to 4 percent slopes*****Setting***

Landform: Alluvial fans, stream terraces, and drainageways  
Slope: 0 to 4 percent

***Composition*****Major Components**

Ethridge and similar soils: 85 percent

**Minor Components**

Marvan and similar soils: 0 to 4 percent  
Vanda and similar soils: 0 to 4 percent  
Acel and similar soils: 0 to 4 percent  
Evanston and similar soils: 0 to 3 percent

***Major Component Description***

Surface layer texture: Silty clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium

Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

**386B—Ethridge-Evanston clay loams, 0 to 4 percent slopes*****Setting***

Landforms: Ethridge—alluvial fans, stream terraces, and drainageways; Evanston—alluvial fans, stream terraces, and drainageways  
Slope: Ethridge—0 to 4 percent; Evanston—0 to 4 percent

***Composition*****Major Components**

Ethridge and similar soils: 50 percent  
Evanston and similar soils: 35 percent

**Minor Components**

Soils that have calcareous surface layers: 0 to 5 percent  
Acel and similar soils: 0 to 4 percent  
Marvan and similar soils: 0 to 3 percent  
Vanda and similar soils: 0 to 3 percent

***Major Component Description*****Ethridge**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

**Evanston**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

**Evanston Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Alluvial fans, stream terraces, and small drainageways  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed Aridic Argiborolls

### Typical Pedon

Evanston clay loam, 0 to 4 percent slopes, in a cropland area, 1,500 feet south and 2,200 feet east of the northwest corner of sec. 1, T. 33 N., R. 3 W.

**Ap**—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and many fine pores; neutral; abrupt smooth boundary.

**Bt**—6 to 15 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong fine and medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; many fine and medium roots and many fine pores; common distinct clay films on faces of peds; mildly alkaline; gradual wavy boundary.

**Bk1**—15 to 26 inches; pale brown (10YR 6/3) clay loam, light brownish gray (10YR 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and common fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**Bk2**—26 to 32 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and common fine pores; common soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

**C**—32 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; common fine roots and few fine pores; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 6 to 15 inches  
*Mollic epipedon thickness:* 7 to 15 inches  
*Content of clay in the control section:* 25 to 35 percent  
*Depth to Bk horizon:* 8 to 20 inches

**Ap horizon**  
 Hue: 2.5Y through 7.5YR  
 Value: 3, 4, or 5 dry; 2 or 3 moist  
 Chroma: 2 or 3 dry or moist  
 Texture: Loam, clay loam, or fine sandy loam  
 Reaction: pH 6.6 to 7.8

**Bt horizon**  
 Hue: 2.5Y through 7.5YR  
 Value: 3, 4, 5, or 6 dry; 3, 4, or 5 moist  
 Chroma: 2, 3, or 4 dry or moist  
 Texture: Clay loam, sandy clay loam, or loam, averaging 18 to 35 percent clay, and more than 15 percent sand but less than 35 percent fine or coarser sand  
 Reaction: pH 7.4 to 8.4

**Bk and C horizons**  
 Hue: 2.5Y through 7.5YR  
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 3 or 4 dry or moist  
 Texture: Loam, clay loam, or sandy clay loam  
 Calcium carbonate equivalent: 6 to 14 percent  
 Reaction: pH 7.9 to 8.4

### 37B—Evanston clay loam, 0 to 4 percent slopes

#### Setting

*Landform:* Alluvial fans, stream terraces, and drainageways  
*Slope:* 0 to 4 percent

#### Composition

##### Major Components

Evanston and similar soils: 85 percent

##### Minor Components

Evanston clay loam, calcareous: 0 to 10 percent  
 Chinook and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.9 inches

**37C—Evanston clay loam, 4 to 8 percent slopes****Setting**

Landform: Alluvial fans, stream terraces, and drainageways  
 Slope: 4 to 8 percent

**Composition****Major Components**

Evanston and similar soils: 85 percent

**Minor Components**

Evanston clay loam, calcareous: 0 to 10 percent  
 Chinook and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.9 inches

**378B—Evanston complex, 0 to 4 percent slopes****Setting**

Landforms: Evanston—alluvial fans, stream terraces, and drainageways; Evanston, calcareous—alluvial fans, stream terraces, and drainageways  
 Slope: Evanston—0 to 4 percent;  
 Evanston, calcareous—0 to 4 percent

**Composition****Major Components**

Evanston and similar soils: 50 percent  
 Evanston, calcareous and similar soils: 35 percent

**Minor Components**

Soils that have slopes more than 4 percent: 0 to 10 percent  
 Evanston fine sandy loam: 0 to 5 percent

**Major Component Description****Evanston**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.9 inches

**Evanston, calcareous**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.9 inches

**372B—Evanston fine sandy loam, 0 to 4 percent slopes****Setting**

Landforms: Alluvial fans, stream terraces, and drainageways  
 Slope: 0 to 4 percent

**Composition****Major Components**

Evanston and similar soils: 85 percent

**Minor Components**

Soils that have slopes more than 4 percent: 0 to 10 percent  
 Chinook and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Fine sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland

Flooding: None  
Available water capacity: 9.9 inches

### **374B—Evanston loam, 0 to 4 percent slopes**

#### ***Setting***

Landforms: Alluvial fans, stream terraces, and drainageways  
Slope: 0 to 4 percent

#### ***Composition***

##### **Major Components**

Evanston and similar soils: 85 percent

##### **Minor Components**

Soils that have slopes more than 4 percent: 0 to 10 percent  
Evanston loam, calcareous: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 10.0 inches

### **374C—Evanston loam, 4 to 8 percent slopes**

#### ***Setting***

Landforms: Alluvial fans, stream terraces, and drainageways  
Slope: 4 to 8 percent

#### ***Composition***

##### **Major Components**

Evanston and similar soils: 85 percent

##### **Minor Components**

Soils that have slopes more than 8 percent: 0 to 10 percent  
Evanston loam, calcareous: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 10.0 inches

### **379C—Evanston-Busby complex, 2 to 8 percent slopes**

#### ***Setting***

Landforms: Evanston—alluvial fans; Busby—alluvial fans  
Slope: Evanston—2 to 8 percent; Busby—2 to 8 percent

#### ***Composition***

##### **Major Components**

Evanston and similar soils: 50 percent  
Busby and similar soils: 40 percent

##### **Minor Components**

Kremlin and similar soils: 0 to 4 percent  
Yetull and similar soils: 0 to 3 percent  
Soils that have slopes more than 8 percent: 0 to 3 percent

#### ***Major Component Description***

##### **Evanston**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

##### **Busby**

Surface layer texture: Fine sandy loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium or eolian material  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 6.9 inches

### 373C—Evanston-Tinsley complex, 2 to 8 percent slopes

#### Setting

Landforms: Evanston—drainageways; Tinsley—kames and eskers

Slope: Evanston—2 to 4 percent; Tinsley—4 to 8 percent

#### Composition

##### Major Components

Evanston and similar soils: 70 percent

Tinsley and similar soils: 20 percent

##### Minor Components

Soils that have slopes more than 8 percent:  
0 to 5 percent

Yetull and similar soils: 0 to 3 percent

Lihen and similar soils: 0 to 2 percent

#### Major Component Description

##### Evanston

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

##### Tinsley

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Glacial outwash

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 1.2 inches

#### Fairway Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat poorly drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 41 inches; rapid below this depth (6.0 to 20.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed Fluvaquent Haploborolls

#### Typical Pedon

Fairway loam in an area of Fairway-Bigsandy loams, 0 to 4 percent slopes; in a rangeland area, 700 feet south and 2,300 feet east of the northwest corner of sec. 18, T. 36 N., R. 2 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and pores; slightly effervescent; mildly alkaline; clear smooth boundary.

A2—3 to 10 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Cg1—10 to 30 inches; light gray (5Y 6/1) loam, dark gray (5Y 4/1) moist; slightly hard, friable, slightly hard and slightly plastic; many very fine and fine roots and pores; violently effervescent; moderately alkaline; clear smooth boundary.

Cg2—30 to 41 inches; gray (10YR 6/1) loam, dark gray (10YR 4/1) moist; few faint brownish yellow (10YR 6/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine and fine pores; violently effervescent; moderately alkaline; clear smooth boundary.

2Cg1—41 to 47 inches; gray (5Y 6/1) sand, dark gray (5Y 4/1) moist; few faint brownish yellow (10YR 6/6) mottles; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

2Cg2—47 to 60 inches; gray (5Y 6/1) sand, dark gray (5Y 4/1) moist; many prominent yellowish brown (10YR 5/6) mottles; single grain; loose, nonsticky and nonplastic; few very fine roots; slightly effervescent; mildly alkaline.



**Range in Characteristics**

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 10 to 15 inches

*Content of clay in the control section:* 18 to 30 percent

*Depth to seasonal high water table:* 36 to 60 inches

**A1 horizon**

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 25 percent

Electrical conductivity: 2 to 8

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 6.6 to 8.4

**A2 horizon**

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1, 2, or 3

Texture: Loam, silt loam, clay loam, or silty clay loam

Clay content: 18 to 20 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: Slightly to strongly

Electrical conductivity: 2 to 8

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 6.6 to 8.4

**Cg horizons**

Hue: 10YR or 2.5Y

Value: 6 dry; 3 or 4 moist

Chroma: 1, 2, or 3

Texture: Loam, silt loam, or silty clay loam with some thin strata of sandy loam, loamy sand, or clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 6.6 to 8.4

**2Cg horizons**

Hue: 2.5Y or 5Y

Value: 6 dry; 3 or 4 moist

Chroma: 1 or 2

Texture: Sand, loamy sand, or sandy loam

Clay content: 0 to 10 percent

Rock fragments: 0 to 60 percent—0 to 5 percent cobbles, 0 to 55 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 0 to 15 percent

Reaction: pH 6.6 to 7.8

**761B—Fairway-Bigsandy loams, 0 to 4 percent slopes****Setting**

Landforms: Fairway—flood plains; Bigsandy—flood plains

Slope: Fairway—0 to 4 percent; Bigsandy—0 to 2 percent

**Composition****Major Components**

Fairway and similar soils: 45 percent

Bigsandy and similar soils: 40 percent

**Minor Components**

Kiwanis and similar soils: 0 to 5 percent

Nesda and similar soils: 0 to 5 percent

Soils that are frequently flooded: 0 to 5 percent

**Major Component Description****Fairway**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: 8.1 inches

**Bigsandy**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: 8.0 inches

**Farnuf Series**

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)

*Landforms:* Alluvial fans, stream terraces, or small drainageways

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed Typic Argiborolls

### Typical Pedon

Farnuf clay loam, 0 to 3 percent slopes, in a cropland area, 500 feet north and 400 feet west of the southeast corner of sec. 8, T. 36 N. R. 4 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; neutral; abrupt smooth boundary.

Bt—7 to 15 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; many very fine and fine roots and pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bk1—15 to 24 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak medium prismatic structure; hard, friable, sticky and plastic; many fine roots and pores; few fine threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—24 to 36 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure; hard, friable, sticky and plastic; common fine roots and many fine pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C—36 to 60 inches; light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 7 to 15 inches

*Mollic epipedon thickness:* 7 to 15 inches

*Content of clay in the control section:* 25 to 35 percent

*Depth to Bk horizon:* 10 to 25 inches

**Note:** Some pedons have a Bk or 2BCKy horizon below depths of 35 inches.

#### Ap horizon

Hue: 2.5Y or 10YR

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 32 percent

Reaction: pH 6.1 to 7.8

#### Bt horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 3, 4, 5, or 6 dry; 2, 3, or 4 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.8

**Note:** Some pedons have a thin Btk horizon.

#### Bk horizons

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, loam, silt loam, silty clay loam, or clay loam

Clay content: 20 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### C horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam—the strata consist of thin layers of fine sandy loam, clay loam, silty clay loam, silty clay, or silt loam

Rock fragments: 0 to 30 percent—0 to 10 percent cobbles, 0 to 20 percent pebbles

Reaction: pH 7.4 to 8.4

## 75B—Farnuf clay loam, 0 to 3 percent slopes

### Setting

Landforms: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 3 percent

### Composition

#### Major Components

Farnuf and similar soils: 85 percent

#### Minor Components

Daglum and similar soils: 0 to 10 percent

Farnuf clay loam, calcareous: 0 to 5 percent

### **Major Component Description**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.7 inches

### **75C—Farnuf clay loam, 3 to 8 percent slopes**

#### **Setting**

Landforms: Alluvial fans, stream terraces, and drainageways  
 Slope: 3 to 8 percent

#### **Composition**

##### **Major Components**

Farnuf and similar soils: 85 percent

##### **Minor Components**

Daglum and similar soils: 0 to 10 percent  
 Farnuf clay loam, calcareous: 0 to 5 percent

### **Major Component Description**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.7 inches

### **Ferd Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landforms:* Alluvial fans, stream terraces, or till plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Glossic Eutroboralfs

### **Typical Pedon**

Ferd loam, 0 to 4 percent slopes, in a cropland area, 2,500 feet north and 2,200 feet west of the southeast corner of sec. 11, T. 32 N., R. 2 W.

Ap—0 to 5 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 4/3) moist; hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; neutral; abrupt smooth boundary.

E/Bt—5 to 9 inches; about 60 percent light brownish gray (2.5Y 6/2) loam, dark brown (10YR 4/3) moist (E part); about 40 percent brown (10YR 5/3) loam, brown (10YR 4/3) moist (Bt part); moderate medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; few faint clay films on faces of peds; neutral; abrupt wavy boundary.

Bt1—9 to 12 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bt2—12 to 16 inches; pale brown (10YR 6/3) clay loam, olive brown (2.5Y 4/3) moist; strong medium prismatic structure parting to strong medium angular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and many very fine and coarse pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bk1—16 to 30 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and many very fine pores; common fine soft masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bk2—30 to 41 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, friable, slightly sticky and plastic; few very fine and fine roots and pores; common fine soft masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

BC—41 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; strongly effervescent; strongly alkaline.

**Range in Characteristics***Control section:* 9 to 16 inches*Content of clay in the control section:* 35 to 50 percent*Depth to Bk horizon:* 12 to 16 inches*Ap horizon*

Hue: 10YR or 2.5Y

Value: 3 or 4 moist

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 7.8

*E/Bt horizon*

Hue: 10YR or 2.5Y

Texture: loam, clay loam, or silty clay loam

Clay content: 22 to 35 percent

Reaction: pH 6.6 to 7.8

*Bt horizons*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Chroma: 2 or 3

Texture: clay loam, silty clay loam, or clay

Clay content: 35 to 50 percent

Electrical conductivity: less than 2 mmhos/cm

Reaction: pH 6.6 to 8.4

*Bk horizons*

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam or silty clay loam

Clay content: 27 to 40 percent

Calcium carbonate equivalent: 5 to 15 percent

Sodium absorption ratio: 0 to 13

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

*BC horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam or silty clay loam

Clay content: 27 to 40 percent

Calcium carbonate equivalent: 5 to 15 percent

Sodium absorption ratio: 8 to 13

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.6

**Note:** Some pedons have a Bk3, By, or Bky horizon and thin lenses of fine sandy loam or fine sand below 30 inches.**39B—Ferd loam, 0 to 4 percent slopes****Setting**

Landforms: Alluvial fans and stream terraces

Slope: 0 to 4 percent

**Composition****Major Components**

Ferd and similar soils: 85 percent

**Minor Components**

Gerdrum and similar soils: 0 to 5 percent

Absher and similar soils: 0 to 5 percent

Soils that have slopes more than 4 percent:  
0 to 5 percent**Major Component Description**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

**391B—Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes****Setting**

Landforms: Ferd—alluvial fans and stream terraces;

Creed—alluvial fans and stream terraces;

Gerdrum—alluvial fans and stream terraces

Position on landform: Ferd—microhighs; Creed—microhighs; Gerdrum—microlows

Slope: Ferd—0 to 4 percent; Creed—0 to 4 percent; Gerdrum—0 to 4 percent

**Composition****Major Components**

Ferd and similar soils: 40 percent

Creed and similar soils: 35 percent

Gerdrum and similar soils: 20 percent

**Minor Components**

Gerdrum fine sandy loam: 0 to 2 percent

Absher and similar soils: 0 to 2 percent

Slickspots: 0 to 1 percent

### ***Major Component Description***

#### **Ferd**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

#### **Creed**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 6.4 inches

#### **Gerdrum**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.8 inches

### **391C—Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes**

#### ***Setting***

Landforms: Ferd—alluvial fans and stream terraces;  
 Creed—alluvial fans and stream terraces;  
 Gerdrum—alluvial fans and stream terraces  
 Position on landform: Ferd—microhighs; Creed—microhighs; Gerdrum—microlows  
 Slope: Ferd—4 to 8 percent; Creed—4 to 8 percent;  
 Gerdrum—4 to 8 percent

#### ***Composition***

#### **Major Components**

Ferd and similar soils: 35 percent  
 Creed and similar soils: 30 percent  
 Gerdrum and similar soils: 20 percent

#### **Minor Components**

Soils that have fine sandy loam surface layers:  
 0 to 5 percent  
 Absher and similar soils: 0 to 4 percent  
 Slickspots: 0 to 3 percent  
 Soils that have slopes more than 8 percent:  
 0 to 3 percent

### ***Major Component Description***

#### **Ferd**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

#### **Creed**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 6.4 inches

#### **Gerdrum**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.8 inches

#### **Fleak Series**

*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Excessively drained  
*Permeability:* Rapid (6.0 to 20.0 inches/hour)  
*Landform:* Hills  
*Parent material:* Residuum weathered from soft sandstone  
*Slope range:* 8 to 25 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Mixed, frigid, shallow Aridic  
Ustipsamments

### Typical Pedon

Fleak fine sandy loam in an area of Fleak-Lihen fine sandy loams, 8 to 25 percent slopes; in a rangeland area, 2,410 feet north and 2,200 feet west of the southeast corner of sec. 18, T. 36 N., R. 1 E.

- A—0 to 4 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; strongly effervescent; mildly alkaline; abrupt wavy boundary.
- C1—4 to 8 inches; light brownish gray (2.5Y 6/2) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; many very fine roots and many very fine and fine pores; violently effervescent; mildly alkaline; clear smooth boundary.
- C2—8 to 18 inches; light brownish gray (2.5Y 6/2) fine sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots and pores; violently effervescent; moderately alkaline; clear smooth boundary.
- Cr—18 to 60 inches; light gray (10YR 7/2) semiconsolidated sandstone, grayish brown (10YR 5/2) moist; violently effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 18 inches

*Content of clay in the control section:* 0 to 15 percent

*Depth to semiconsolidated bedrock:* 10 to 20 inches

#### A horizon

Hue: 10YR, 7.5YR, or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Reaction: pH 6.6 to 7.8

#### C horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Above the sandstone is fine sand or loamy fine sand

Clay content: 0 to 15 percent

Reaction: pH 6.6 to 8.4

#### Cr horizon

Reaction: pH 6.6 to 8.4

## 651E—Fleak-Lihen fine sandy loams, 8 to 25 percent slopes

### Setting

Landforms: Fleak—hills; Lihen—hills

Position on landform: Fleak—shoulders; Lihen—back slopes

Slope: Fleak—8 to 25 percent; Lihen—8 to 25 percent

### Composition

#### Major Components

Fleak and similar soils: 50 percent

Lihen and similar soils: 35 percent

#### Minor Components

Soils that have slopes less than 8 percent: 0 to 10 percent

Yamac and similar soils: 0 to 5 percent

### Major Component Description

#### Fleak

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Excessively drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 1.4 inches

#### Lihen

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.5 inches

### Floweree Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderately slow (0.2 to 0.6 inch/hour)

*Landform:* Alluvial fans

*Parent material:* Alluvium or eolian deposits

*Slope range:* 2 to 8 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-silty, mixed Aridic  
Haploborolls

### Typical Pedon

Floweree silt loam, 2 to 8 percent slopes, in a rangeland area, 2,600 feet north and 50 feet east of the southwest corner of sec. 18, T. 30 N., R. 1 W.

**A**—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and plastic; few very fine roots and pores; mildly alkaline; clear smooth boundary.

**Bw**—5 to 11 inches; grayish brown (10YR 5/2) silty loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots and few very fine pores; mildly alkaline; clear smooth boundary.

**Bk1**—11 to 17 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure; slightly hard, friable, sticky and plastic; few fine and coarse roots and few fine pores; few fine threads of lime; strongly effervescent; mildly alkaline; clear smooth boundary.

**Bk2**—17 to 25 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and plastic; few fine roots and pores; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

**C**—25 to 60 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; violently effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 7 to 15 inches

*Content of clay in the control section:* 20 to 35 percent

*Depth to Bk horizon:* 11 to 25 inches

#### *A horizon*

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

#### *Bw horizon*

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 20 to 35

Reaction: pH 7.4 to 8.4

#### *Bk1 horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### *Bk2 horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, 7, or 8 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 9.0

#### *BC horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or loam consisting of thin strata of silt loam, very fine sandy loam and/or clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium absorption ratio: 0 to 15

Reaction: pH 7.9 to 9.0

**Note:** Some pedons have a Bky horizon.

## 49C—Floweree silt loam, 2 to 8 percent slopes

### Setting

Landform: Alluvial fans

Slope: 2 to 8 percent

### Composition

#### Major Components

Floweree and similar soils: 85 percent

#### Minor Components

Lonna and similar soils: 0 to 10 percent

Brockway and similar soils: 0 to 5 percent

### Major Component Description

Surface layer texture: Silt loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium or eolian material  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 10.4 inches

### Gerber Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landforms:* Alluvial fans or stream terraces  
*Parent material:* Alluvium  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine, montmorillonitic Vertic Argiborolls

### Typical Pedon

Gerber clay, 0 to 4 percent slopes, in a cropland area, 50 feet north and 2,600 feet west of the southeast corner of sec. 32, T. 37 N., R. 4 W.

- Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, firm, sticky and plastic; many very fine and common fine roots and common very fine and fine discontinuous vesicular pores; mildly alkaline; abrupt smooth boundary.
- Bt—6 to 15 inches; brown (10YR 5/3) silty clay, dark brown (2.5Y 4/3) moist; strong medium blocky structure; very hard, very firm, sticky and plastic; few very fine and common fine roots and common fine discontinuous pores; common faint clay films on faces of peds; common pressure faces; mildly alkaline; clear wavy boundary.
- Bk—15 to 20 inches; light brownish gray (2.5Y 6/2) silty clay, olive gray (5Y 5/2) moist; strong medium blocky structure; extremely hard, firm, sticky and plastic; few very fine roots and discontinuous tubular pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.
- C—20 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; few very

fine roots and discontinuous tubular pores; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches  
*Content of clay in the control section:* 35 to 60 percent  
*Depth to Bk horizon:* 12 to 20 inches  
**Note:** Some pedons have By or 2C horizons.

#### Ap horizon

Value: 4 or 5 dry; 3 moist  
 Chroma: 2 or 3  
 Clay content: 40 to 50 percent  
 Reaction: pH 6.6 to 7.8

#### Bt horizon

Value: 4 or 5 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Silty clay or clay  
 Clay content: 45 to 60 percent  
 Reaction: pH 7.4 to 8.4  
**Note:** A Btk horizon is allowed.

#### Bk horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Silty clay, silty clay loam, clay loam, or clay  
 Clay content: 35 to 50 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 8.4

#### C horizon

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Clay loam, silty clay loam, silty clay, or clay  
 Clay content: 35 to 50 percent  
 Rock fragments: 0 to 10 percent pebbles  
 Calcium carbonate equivalent: 3 to 15 percent  
 Reaction: pH 7.4 to 9.0

### 68B—Gerber clay, 0 to 4 percent slopes

#### Setting

Landforms: Alluvial fans and stream terraces  
 Slope: 0 to 4 percent

#### Composition

#### Major Components

Gerber and similar soils: 85 percent



### Minor Components

Gerber clay calcareous: 0 to 7 percent  
 Soils that are ponded: 0 to 2 percent  
 Daglum and similar soils: 0 to 6 percent

### Major Component Description

Surface layer texture: Clay  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

### Gerdrum Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Very slow (less than 0.06 inch/hour)  
*Landforms:* Alluvial fans or stream terraces  
*Parent material:* Alluvium  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Typic  
 Natriboralfs

### Typical Pedon

Gerdrum clay loam in an area of Gerdrum-Absher complex, 0 to 2 percent slopes; in a rangeland area, 1,500 feet north and 2,300 feet east of the southwest corner of sec. 31, T. 33 N., R. 1 W.

- E—0 to 4 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; strong thin platy structure; hard, friable, sticky and plastic; many very fine and fine roots and common very fine and fine pores; mildly alkaline; abrupt smooth boundary.
- B<sub>tn</sub>1—4 to 7 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong coarse columnar structure; hard, friable, sticky and plastic; many very fine and fine roots and common very fine and fine pores; many distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.
- B<sub>tn</sub>2—7 to 14 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong coarse prismatic structure; hard, friable, sticky and plastic; many very fine and fine roots and common very fine and fine pores; many distinct clay films on faces of peds; strongly alkaline; clear smooth boundary.

B<sub>kn</sub>—14 to 29 inches; light brownish gray (10YR 6/2) clay loam, dark brownish gray (10YR 4/2) moist; weak coarse prismatic structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and pores; common soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

B<sub>nyz</sub>1—29 to 45 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive; very hard, firm, sticky and plastic; common very fine and fine roots and few very fine and fine pores; common soft masses and seams of gypsum and other salts; strongly alkaline; gradual smooth boundary.

B<sub>nyz</sub>2—45 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; common soft masses and seams of gypsum and other salts; strongly alkaline.

### Range in Characteristics

*Control section:* 4 to 14 inches  
*Content of clay in the control section:* 35 to 55 percent  
*Depth to the B<sub>kn</sub> horizon:* 10 to 24 inches  
*Depth to the B<sub>nyz</sub> horizon:* 10 to 29 inches

### E horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4, 5, or 6 moist  
 Chroma: 2 or 3  
 Clay content: 27 to 40 percent  
 Reaction: pH 6.6 to 7.8

### B<sub>tn</sub>1 horizon

Hue: 10YR or 2.5Y  
 Value: 5, 6, or 7 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Clay, silty clay, or silty clay loam  
 Clay content: 35 to 55 percent  
 Rock fragments: 0 to 10 percent pebbles  
 Structure: Fine to coarse columnar or medium or coarse blocky  
 Hardness: Extremely or very hard when dry  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Sodium adsorption ratio: 10 to 20; pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2  
 Reaction: pH 7.4 to 9.0

### B<sub>tn</sub>2 horizon

Hue: 10YR or 2.5Y  
 Value: 5, 6, or 7 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 55 percent  
 Rock fragments: 0 to 10 percent pebbles  
 Structure: Fine to coarse prismatic or medium or coarse blocky  
 Hardness: Extremely or very hard when dry  
 Electrical conductivity: 2 to 8 mmhos/cm  
 Sodium absorption ratio: 10 to 20; pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2  
 Reaction: pH 7.4 to 9.0

*Bkn and Bnyz horizons*

Hue: 10YR, 2.5Y, or 5Y  
 Value: 4, 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Clay loam, sandy clay loam, clay, or silty clay  
 Clay content: 30 to 50 percent  
 Rock fragments: 0 to 10 percent pebbles  
 Calcium carbonate equivalent: 5 to 15 percent  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Sodium absorption ratio: 13 to 30  
 Gypsum: 1 to 5 percent  
 Reaction: pH 7.9 to 9.0

**402A—Gerdrum-Absher complex, 0 to 2 percent slopes**

***Setting***

Landforms: Gerdrum—alluvial fans and stream terraces; Absher—alluvial fans and stream terraces  
 Position on landform: Gerdrum—microhighs; Absher—microlows  
 Slope: Gerdrum—0 to 2 percent; Absher—0 to 2 percent

***Composition***

**Major Components**

Gerdrum and similar soils: 55 percent  
 Absher and similar soils: 30 percent

**Minor Components**

Ferd and similar soils: 0 to 5 percent  
 Nobe and similar soils: 0 to 5 percent  
 Slickspots: 0 to 5 percent

***Major Component Description***

**Gerdrum**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.8 inches

**Absher**

Surface layer texture: Clay  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Moderately well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 4.1 inches

**Glendive Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid (2.0 to 6.0 inches/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents

**Typical Pedon**

Glendive fine sandy loam in an area of Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded; in a rangeland area, 1,800 feet south and 3,000 feet east of the northwest corner of sec. 9, T. 31 N., R. 4 W.

- A—0 to 2 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; common very fine and fine roots and many very fine and fine discontinuous vesicular pores; violently effervescent; neutral; clear smooth boundary.
- C1—2 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, friable, nonsticky and nonplastic; many very fine and fine roots and common very fine discontinuous

vesicular pores; violently effervescent; mildly alkaline; gradual smooth boundary.

**C2**—8 to 60 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots and pores; violently effervescent; mildly alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 5 to 18 percent

#### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent clay

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.6 to 9.0

**Note:** This horizon with values of 4 or 5 dry, 3 or 4 moist and chroma of 2 or 3 may meet the requirements for mollic except for thickness.

#### C1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, sandy loam, or fine sandy loam

Clay content: 5 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

#### C2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Sandy loam or fine sandy loam consisting of strata of loam, sandy loam, silt loam, loamy sand, loamy fine sand, and occasionally clay loam

Clay content: 5 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.4 to 9.0

**Note:** Some pedons have 15 to 60 percent coarse fragments below a depth of 40 inches.

### Hanly Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Somewhat excessively drained

*Permeability:* Rapid (6.0 to 20.0 inches/hour)

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Sandy, mixed, frigid Aridic Ustifluvents

#### Typical Pedon

Hanly loamy sand in an area of Hanly-Glendive-Havre complex, 0 to 2 percent slopes; in a rangeland area, 1,300 feet north and 600 feet west of the southeast corner of sec. 35, T. 35 N., R. 2 E.

**A**—0 to 4 inches; light brownish gray (10YR 6/2) loamy sand, dark brownish gray (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; strongly effervescent; neutral; clear smooth boundary.

**C1**—4 to 14 inches; light gray (10YR 7/2) stratified sand and loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; strongly effervescent; neutral; clear smooth boundary.

**C2**—14 to 31 inches; light brownish gray (10YR 6/2) stratified sand and loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; strongly effervescent; mildly alkaline; clear smooth boundary.

**C3**—31 to 60 inches; light brownish gray (10YR 6/2) stratified sand and loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 0 to 10 percent

#### A horizon

Hue: 2.5Y or 10YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist (surface horizons having value as dark as 5 dry and 3 moist do not exceed 6 inches in thickness)

Chroma: 2 or 3

Clay content: 5 to 10 percent

Reaction: pH 6.6 to 8.4

*C horizons*

Hue: 10YR, 2.5Y, or 5YR  
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Clay content: 5 to 10 percent  
 Reaction: pH 6.6 to 8.4

**Note:** Some pedons contain thin coarse sand layers below a depth of 31 inches; a few pedons contain thin Ab horizons below a depth of 40 inches.

### 101A—Hanly-Glendive-Havre complex, 0 to 2 percent slopes

#### **Setting**

Landforms: Hanly—flood plains; Glendive—flood plains; Havre—flood plains  
 Slope: Hanly—0 to 2 percent; Glendive—0 to 2 percent; Havre—0 to 2 percent

#### **Composition**

#### **Major Components**

Hanly and similar soils: 50 percent  
 Glendive and similar soils: 20 percent  
 Havre and similar soils: 15 percent

#### **Minor Components**

Korchea and similar soils: 0 to 3 percent  
 Bigsag and similar soils: 0 to 3 percent  
 Bigsandy and similar soils: 0 to 3 percent  
 Harlem and similar soils: 0 to 3 percent  
 Soils with areas of cottonwood trees: 0 to 3 percent

#### **Major Component Description**

##### **Hanly**

Surface layer texture: Loamy sand  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Excessively drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Rare  
 Available water capacity: 5.7 inches

##### **Glendive**

Surface layer texture: Fine sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 7.4 inches

##### **Havre**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Rare  
 Available water capacity: 9.7 inches

### **Harlake Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents

#### **Typical Pedon**

Harlake silty clay loam, 0 to 2 percent slopes, in a rangeland area, 1,800 feet north and 300 feet west of the southeast corner of sec. 12, T. 31 N., R. 4 W.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate thin and medium platy structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and many very fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—4 to 16 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure; hard, firm, very sticky and very plastic; common very fine roots and many very fine pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—16 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots and common very fine pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

C3—30 to 60 inches; dark grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; few fine roots and common fine pores; slightly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 60 percent

#### A horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.6 to 8.4

**Note:** Some pedons have a thin dark colored surface about 4 inches thick that has values of 4 or 5 dry, 3 moist, and chroma of 2 or 3.

#### C1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay

Clay content: 35 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

#### C2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay

Clay content: 35 to 60 percent

Electrical conductivity: 0 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

#### C3 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam, loam, clay loam, or fine sandy loam consisting of stratified layers of silty clay loam, silt loam, and fine sandy loam

Clay content: 15 to 35 percent

Electrical conductivity: 0 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

## 90A—Harlake silty clay loam, 0 to 2 percent slopes

### Setting

Landform: Flood plains

Slope: 0 to 2 percent

### Composition

#### Major Components

Harlake and similar soils: 85 percent

#### Minor Components

Havre and similar soils: 0 to 5 percent

Soils that are occasionally flooded: 0 to 4 percent

Bigsag and similar soils: 0 to 3 percent

Bigsandy and similar soils: 0 to 3 percent

### Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 8.3 inches

## Havre Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents

### Typical Pedon

Havre loam in an area of Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded; in a cropland area, 300 feet south and 100 feet east of the northwest corner of sec. 36, T. 31 N., R. 2 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; few very fine roots and discontinuous pores; strongly effervescent; mildly alkaline; clear wavy boundary.

C1—6 to 24 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots and discontinuous pores; strongly effervescent; mildly alkaline; gradual wavy boundary.

C2—24 to 37 inches; light yellowish brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots and discontinuous pores; strongly effervescent; mildly alkaline; gradual wavy boundary.

C3—37 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; hard, firm, slightly sticky and plastic; strongly effervescent; mildly alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 18 to 35 percent

#### Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, clay loam, or silty clay loam

Clay content: 15 to 40 percent

Reaction: pH 6.1 to 9.0

**Note:** Some pedons have a thin A horizon that has a value of 4 dry and 3 moist and does not meet the requirement for a mollic epipedon after mixing to 7 inches.

#### C horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, silt loam, or clay loam which consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam

Clay content: 18 to 35 percent

Reaction: pH 7.4 to 9.0

**Note:** Some pedons have 15 to 60 percent coarse fragments below a depth of 40 inches.

### 60A—Havre silty clay loam, 0 to 2 percent slopes

#### Setting

Landform: Flood plains

Slope: 0 to 2 percent

#### Composition

##### Major Components

Havre and similar soils: 85 percent

##### Minor Components

Hanly and similar soils: 0 to 5 percent

Bigsag and similar soils: 0 to 3 percent

Bigsandy and similar soils: 0 to 2 percent

Rivra and similar soils: 0 to 5 percent

#### Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 9.6 inches

### 603A—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded

#### Setting

Landforms: Havre—flood plains; Glendive—flood plains

Slope: Havre—0 to 2 percent; Glendive—0 to 2 percent

#### Composition

##### Major Components

Havre and similar soils: 45 percent

Glendive and similar soils: 40 percent

##### Minor Components

Soils that are rarely flooded: 0 to 3 percent

Harlem and similar soils: 0 to 3 percent

Soils that are frequently flooded: 0 to 3 percent

Bigsag and similar soils: 0 to 2 percent

Bigsandy and similar soils: 0 to 2 percent

Soils with areas of cottonwood trees: 0 to 2 percent

### ***Major Component Description***

#### **Havre**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Occasional  
 Available water capacity: 9.7 inches

#### **Glendive**

Surface layer texture: Fine sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Occasional  
 Available water capacity: 7.5 inches

### **601A—Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded**

#### ***Setting***

Landforms: Havre—flood plains; Glendive—flood plains  
 Slope: Havre—0 to 2 percent; Glendive—0 to 2 percent

#### ***Composition***

#### **Major Components**

Havre and similar soils: 50 percent  
 Glendive and similar soils: 35 percent

#### **Minor Components**

Harlem and similar soils: 0 to 5 percent  
 Soils that are occasionally flooded: 0 to 4 percent  
 Bigsag and similar soils: 0 to 3 percent  
 Bigsandy and similar soils: 0 to 3 percent

### ***Major Component Description***

#### **Havre**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Rare  
 Available water capacity: 9.7 inches

#### **Glendive**

Surface layer texture: Fine sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Rare  
 Available water capacity: 7.4 inches

### **Hedstrom Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour) to 31 inches; rapid below this depth (6.0 to 20.0 inches/hour)  
*Landforms:* Alluvial fans or relict stream terraces  
*Parent material:* Alluvium  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls

#### **Typical Pedon**

Hedstrom fine sandy loam, 0 to 4 percent slopes, in a cropland area, 2,400 feet north and 2,750 feet west of the southeast corner of sec. 12, T. 35 N., R. 3 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and discontinuous pores; neutral; gradual wavy boundary.

Bt1—5 to 12 inches; dark brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and discontinuous pores; common distinct clay films on faces of peds; neutral; gradual wavy boundary.

Bt2—12 to 21 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and discontinuous pores; common distinct clay films on faces of peds; neutral; abrupt wavy boundary.

**Bk**—21 to 31 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and discontinuous pores; many medium soft masses and seams of lime; violently effervescent; moderately alkaline; abrupt wavy boundary.

**2C**—31 to 60 inches; light brownish gray (2.5Y 6/2) sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline.

#### Range in Characteristics

*Control section:* 5 to 40 inches

*Mollic epipedon thickness:* 10 to 16 inches

*Depth to Bk horizon:* 15 to 30 inches

*Depth to 2C horizon:* 20 to 40 inches

#### Ap horizon

Value: 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 20 percent

Reaction: pH 6.6 to 7.3

#### Bt horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Sandy clay loam or clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

#### Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Sandy clay loam or loam

Clay content: 20 to 30 percent

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.9 to 9.0

#### 2C horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Sand, fine sand, or loamy fine sand

Clay content: 0 to 5 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

## 59B—Hedstrom fine sandy loam, 0 to 4 percent slopes

### Setting

Landforms: Alluvial fans and stream terraces

Slope: 0 to 4 percent

### Composition

#### Major Components

Hedstrom and similar soils: 85 percent

#### Minor Components

Dast and similar soils: 0 to 8 percent

Gerber and similar soils: 0 to 7 percent

### Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.8 inches

## Hillon Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landforms:* Hills, escarpments, or till plains

*Parent material:* Glacial till

*Slope range:* 0 to 70 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents

### Typical Pedon

Hillon clay loam in an area of Joplin-Hillon clay loams, 0 to 3 percent slopes; in a rangeland area, 250 feet north and 2,300 feet east of the southwest corner of sec. 17, T. 36 N., R. 1 E.

**A**—0 to 5 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong very fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots and common very fine and fine discontinuous pores; strongly effervescent; moderately alkaline; clear smooth boundary.



**Bk1**—5 to 12 inches; light brownish gray (10YR 6/2) clay loam, dark brownish gray (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; many very fine and fine roots and discontinuous pores; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

**Bk2**—12 to 30 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and discontinuous pores; many fine and medium soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

**Bky**—30 to 40 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine roots and discontinuous pores; few fine soft masses of lime; common medium soft masses of gypsum; slightly effervescent; mildly alkaline; clear wavy boundary.

**C**—40 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots and discontinuous pores; slightly effervescent; mildly alkaline.

#### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 20 to 35 percent

#### *A horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 25 percent—0 to 10 percent cobbles and stones, 0 to 15 percent pebbles

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 7.4 to 8.4

#### *Bk horizons*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent with 25 to 35 percent fine sand and coarser sand

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Bulk density: 1.55 to 1.75 g/ccm

Reaction: pH 7.9 to 9.0

#### *Bky and C horizons*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent with 25 to 35 percent fine sand and coarser sand

Rock fragments: 0 to 15 percent pebbles

Bulk density: 1.55 to 1.75 g/ccm

Calcium carbonate equivalent: 2 to 12 percent

Reaction: pH 7.9 to 9.0

### **22E—Hillon clay loam, 8 to 25 percent slopes**

#### *Setting*

Landform: Hills

Slope: 8 to 25 percent

#### *Composition*

##### **Major Components**

Hillon and similar soils: 85 percent

##### **Minor Components**

Slopes more than 25 percent: 0 to 5 percent

Kevin and similar soils: 0 to 4 percent

Neldore and similar soils: 0 to 2 percent

Bascovy and similar soils: 0 to 2 percent

Cabbart and similar soils: 0 to 2 percent

#### *Major Component Description*

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

### **22F—Hillon clay loam, 25 to 60 percent slopes**

#### *Setting*

Landform: Hills

Slope: 25 to 60 percent

***Composition*****Major Components**

Hillon and similar soils: 90 percent

**Minor Components**

Rock outcrop: 0 to 2 percent

Neldore and similar soils: 0 to 2 percent

Bascovy and similar soils: 0 to 2 percent

Cabbart and similar soils: 0 to 2 percent

Noncalcareous surface layers: 0 to 2 percent

***Major Component Description***

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

**423C—Hillon-Joplin clay loams, 3 to 8 percent slopes*****Setting***

Landforms: Hillon—till plains; Joplin, calcareous—till plains

Position on landform: Hillon—back slopes; Joplin, calcareous—foot slopes

Slope: Hillon—3 to 8 percent; Joplin, calcareous—3 to 8 percent

***Composition*****Major Components**

Hillon and similar soils: 50 percent

Joplin, calcareous and similar soils: 35 percent

**Minor Components**

Noncalcareous surface layers: 0 to 10 percent

McKenzie and similar soils: 0 to 2 percent

Elloam and similar soils: 0 to 2 percent

Marvan and similar soils: 0 to 1 percent

***Major Component Description*****Hillon**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

**Joplin, calcareous**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.1 inches

**224E—Hillon-Joplin loams, 8 to 25 percent slopes*****Setting***

Landforms: Hillon—hills; Joplin—hills

Position on landform: Hillon—shoulders; Joplin—back slopes

Slope: Hillon—15 to 25 percent; Joplin—8 to 15 percent

***Composition*****Major Components**

Hillon and similar soils: 50 percent

Joplin and similar soils: 35 percent

**Minor Components**

Elloam and similar soils: 0 to 5 percent

Hillon gravelly loam: 0 to 5 percent

Joplin gravelly loam: 0 to 5 percent

***Major Component Description*****Hillon**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.0 inches

**Joplin**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None  
Available water capacity: 9.2 inches

## **221E—Hillon-Kevin clay loams, 15 to 25 percent slopes**

### ***Setting***

Landforms: Hillon—hills; Kevin—hills  
Position on landform: Hillon—shoulders; Kevin—back slopes  
Slope: Hillon—15 to 25 percent; Kevin—15 to 25 percent

### ***Composition***

#### **Major Components**

Hillon and similar soils: 55 percent  
Kevin and similar soils: 30 percent

#### **Minor Components**

Delpoint and similar soils: 0 to 8 percent  
Soils that have slopes more than 25 percent: 0 to 7 percent

### ***Major Component Description***

#### **Hillon**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

#### **Kevin**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

## **222E—Hillon-Neldore complex, 8 to 25 percent slopes**

### ***Setting***

Landforms: Hillon—hills; Neldore—hills  
Position on landform: Hillon—shoulders; Neldore—back slopes

Slope: Hillon—8 to 15 percent; Neldore—15 to 25 percent

### ***Composition***

#### **Major Components**

Hillon and similar soils: 50 percent  
Neldore and similar soils: 35 percent

#### **Minor Components**

Soils that have slopes more than 25 percent: 0 to 10 percent  
Rock outcrop: 0 to 5 percent

### ***Major Component Description***

#### **Hillon**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

#### **Neldore**

Surface layer texture: Clay  
Depth class: Shallow (10 to 20 inches)  
Drainage class: Well drained  
Dominant parent material: Shale residuum  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 2.6 inches

## **222F—Hillon-Neldore complex, 25 to 70 percent slopes**

### ***Setting***

Landforms: Hillon—hills; Neldore—hills  
Position on landform: Hillon—shoulders; Neldore—back slopes  
Slope: Hillon—45 to 70 percent; Neldore—25 to 45 percent

### ***Composition***

#### **Major Components**

Hillon and similar soils: 45 percent  
Neldore and similar soils: 40 percent

#### **Minor Components**

Soils that have slopes less than 25 percent: 0 to 10 percent  
Rock outcrop: 0 to 5 percent

### Major Component Description

#### Hillon

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.9 inches

#### Neldore

Surface layer texture: Clay  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 2.6 inches

#### Joplin Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landforms:* Till plains or hills  
*Parent material:* Glacial till  
*Slope range:* 0 to 15 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed Aridic  
 Argiborolls

#### Typical Pedon

Joplin clay loam, 0 to 4 percent slopes, in a cropland area, 1,600 feet north and 1,600 feet east of the southwest corner of sec. 3, T. 32 N., R. 3 W.

Ap—0 to 4 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; few very fine roots and common very fine discontinuous pores; neutral; clear smooth boundary.

Bt—4 to 9 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure; slightly hard, firm, sticky and plastic; few very fine roots and common very fine discontinuous pores; common distinct clay films on faces of peds; neutral; gradual wavy boundary.

Bk1—9 to 16 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium

subangular blocky structure; hard, firm, sticky and plastic; few very fine roots and common very fine discontinuous pores; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—16 to 26 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak moderate subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine roots and common very fine discontinuous pores; many soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—26 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots and common very fine discontinuous pores; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 4 to 40 inches

*Mollic epipedon thickness:* 7 to 9 inches

*Content of clay in the control section:* 18 to 32 percent

*Depth to Bk horizon:* Less than 10 inches

#### Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Texture: Clay loam or loam

Clay content: 10 to 32 percent

Rock fragments: 0 to 35 percent—0 to 10 percent cobbles, 0 to 25 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 8.4

#### Bt horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

#### Bk horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 32 percent

Rock fragments: 0 to 35 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3  
 Texture: Loam or clay loam  
 Clay content: 18 to 32 percent  
 Rock fragments: 0 to 35 percent pebbles  
 Moist bulk density: 1.6 to 1.8 gr/cm  
 Reaction: pH 7.4 to 8.4  
**Note:** Some pedons have some gypsum and salts in the lower part of the C horizon.

#### **42B—Joplin clay loam, 0 to 4 percent slopes**

##### ***Setting***

Landform: Till plains  
 Slope: 0 to 4 percent

##### ***Composition***

##### **Major Components**

Joplin and similar soils: 85 percent

##### **Minor Components**

Joplin clay loam calcareous: 0 to 5 percent  
 Elloam and similar soils: 0 to 5 percent  
 Soils that have slopes more than 4 percent: 0 to 5 percent

##### ***Major Component Description***

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

#### **42C—Joplin clay loam, 4 to 8 percent slopes**

##### ***Setting***

Landform: Till plains  
 Slope: 4 to 8 percent

##### ***Composition***

##### **Major Components**

Joplin and similar soils: 85 percent

##### **Minor Components**

Joplin clay loam, calcareous: 0 to 5 percent  
 Elloam and similar soils: 0 to 5 percent

Soils that have slopes more than 8 percent: 0 to 5 percent

##### ***Major Component Description***

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

#### **427B—Joplin complex, 0 to 4 percent slopes**

##### ***Setting***

Landforms: Joplin—till plains; Joplin, calcareous—till plains  
 Slope: Joplin—0 to 4 percent; Joplin, calcareous—0 to 4 percent

##### ***Composition***

##### **Major Components**

Joplin and similar soils: 45 percent  
 Joplin, calcareous and similar soils: 40 percent

##### **Minor Components**

Elloam and similar soils: 0 to 7 percent  
 McKenzie and similar soils: 0 to 2 percent  
 Soils that have slopes more than 4 percent: 0 to 6 percent

##### ***Major Component Description***

##### **Joplin**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

##### **Joplin, calcareous**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

**427C—Joplin complex, 4 to 8 percent slopes*****Setting***

Landforms: Joplin—till plains; Joplin, calcareous—till plains  
 Position on landform: Joplin—foot slopes; Joplin, calcareous—back slopes  
 Slope: Joplin—4 to 8 percent; Joplin, calcareous—4 to 8 percent

***Composition*****Major Components**

Joplin and similar soils: 50 percent  
 Joplin, calcareous and similar soils: 35 percent

**Minor Components**

Elloam and similar soils: 0 to 13 percent  
 McKenzie and similar soils: 0 to 2 percent

***Major Component Description*****Joplin**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

**Joplin, calcareous**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

**426B—Joplin loam, 0 to 4 percent slopes*****Setting***

Landform: Till plains  
 Slope: 0 to 4 percent

***Composition*****Major Components**

Joplin and similar soils: 85 percent

**Minor Components**

Elloam and similar soils: 0 to 7 percent  
 McKenzie and similar soils: 0 to 2 percent  
 Joplin loam calcareous: 0 to 6 percent

***Major Component Description***

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.2 inches

**423B—Joplin-Hillon clay loams, 0 to 3 percent slopes*****Setting***

Landforms: Joplin, calcareous—till plains; Hillon—till plains  
 Slope: Joplin, calcareous—0 to 3 percent; Hillon—0 to 3 percent

***Composition*****Major Components**

Joplin, calcareous and similar soils: 50 percent  
 Hillon and similar soils: 35 percent

**Minor Components**

Soils that have noncalcareous surface layers: 0 to 7 percent  
 McKenzie and similar soils: 0 to 2 percent  
 Elloam and similar soils: 0 to 6 percent

***Major Component Description*****Joplin, calcareous**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

**Hillon**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland

Flooding: None  
Available water capacity: 9.9 inches

### **421C—Joplin-Hillon clay loams, 2 to 8 percent slopes**

#### ***Setting***

Landforms: Joplin—till plains; Hillon—till plains  
Position on landform: Joplin—back slopes; Hillon—shoulders  
Slope: Joplin—2 to 8 percent; Hillon—2 to 8 percent

#### ***Composition***

##### **Major Components**

Joplin and similar soils: 55 percent  
Hillon and similar soils: 40 percent

##### **Minor Components**

Elloam and similar soils: 0 to 2 percent  
McKenzie and similar soils: 0 to 2 percent  
Slopes more than 8 percent: 0 to 1 percent

#### ***Major Component Description***

##### **Joplin**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.1 inches

##### **Hillon**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

### **421D—Joplin-Hillon clay loams, 8 to 15 percent slopes**

#### ***Setting***

Landforms: Joplin—hills; Hillon—hills  
Position on landform: Joplin—back slopes; Hillon—shoulders  
Slope: Joplin—8 to 15 percent; Hillon—8 to 15 percent

#### ***Composition***

##### **Major Components**

Joplin and similar soils: 45 percent  
Hillon and similar soils: 40 percent

##### **Minor Components**

Elloam and similar soils: 0 to 13 percent  
McKenzie and similar soils: 0 to 2 percent

#### ***Major Component Description***

##### **Joplin**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.1 inches

##### **Hillon**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

### **424C—Joplin-Hillon gravelly loams, 3 to 8 percent slopes**

#### ***Setting***

Landforms: Joplin—till plains; Hillon—till plains  
Position on landform: Joplin—foot slopes; Hillon—back slopes  
Slope: Joplin—3 to 8 percent; Hillon—3 to 8 percent

#### ***Composition***

##### **Major Components**

Joplin and similar soils: 50 percent  
Hillon and similar soils: 35 percent

##### **Minor Components**

Elloam and similar soils: 0 to 7 percent  
McKenzie and similar soils: 0 to 2 percent  
Soils that have slopes more than 8 percent: 0 to 6 percent

### ***Major Component Description***

#### **Joplin**

Surface layer texture: Gravelly loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

#### **Hillon**

Surface layer texture: Gravelly loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.8 inches

### **425C—Joplin-Telstad clay loams, 2 to 8 percent slopes**

#### ***Setting***

Landforms: Joplin, calcareous—till plains;  
 Telstad—till plains  
 Position on landform: Joplin, calcareous—back slopes; Telstad—foot slopes  
 Slope: Joplin, calcareous—2 to 8 percent; Telstad—2 to 8 percent

#### ***Composition***

#### **Major Components**

Joplin, calcareous and similar soils: 50 percent  
 Telstad and similar soils: 35 percent

#### **Minor Components**

Soils that have noncalcareous surface layers: 0 to 7 percent  
 McKenzie and similar soils: 0 to 2 percent  
 Elloam and similar soils: 0 to 6 percent

### ***Major Component Description***

#### **Joplin, calcareous**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.1 inches

#### **Telstad**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.8 inches

### **Kenilworth Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Till plains  
*Parent material:* Alluvium or eolian deposits over glacial till  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed Aridic Argiborolls

#### **Typical Pedon**

Kenilworth fine sandy loam, 0 to 4 percent slopes, in a cropland area, 2,100 feet east and 1,200 feet south of the northwest corner of sec. 21, T. 32 N., R. 1 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots and discontinuous pores; mildly alkaline; clear smooth boundary.

Bt—6 to 11 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure; hard, firm, sticky and plastic; few very fine roots and discontinuous pores; few faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk1—11 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and discontinuous pores; few medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Bk2—15 to 24 inches; light gray (10YR 7/2) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and



discontinuous pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**2C1**—24 to 37 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse angular blocky structure; hard, firm, very sticky and plastic; moderately alkaline; gradual wavy boundary.

**2C2**—37 to 60 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak coarse angular blocky structure; very hard, very firm, very sticky and plastic; moderately alkaline.

#### Range in Characteristics

*Control section:* 6 to 11 inches

*Mollic epipedon thickness:* 7 to 15 inches

*Content of clay in the control section:* 18 to 30 percent

*Depth to Bk horizon:* 12 to 24 inches

#### *Ap horizon*

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loam

Clay content: 10 to 20 percent

Reaction: pH 6.6 to 7.8

#### *Bt horizon*

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Sandy clay loam, fine sandy loam, or loam

Clay content: 15 to 30 percent—more than 45 percent fine and coarser sand

Bulk density: 1.40 to 1.60

Reaction: pH 6.6 to 7.8

#### *Bk1 horizon*

Chroma: 3 or 4

Clay content: 15 to 25 percent—20 to more than 45 percent fine and coarser sand

Bulk density: 1.40 to 1.60

Reaction: pH 7.4 to 8.4

#### *2Bk2 horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Bulk density: greater than 1.6

Reaction: pH 7.4 to 8.4

#### *2C horizons*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

**Note:** Some pedons have a 2Bky horizon.

### **191B—Kenilworth fine sandy loam, 0 to 4 percent slopes**

#### **Setting**

Landform: Till plains

Slope: 0 to 4 percent

#### **Composition**

##### **Major Components**

Kenilworth and similar soils: 85 percent

##### **Minor Components**

Kenilworth loamy sand: 0 to 10 percent

Telstad and similar soils: 0 to 5 percent

#### **Major Component Description**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.4 inches

### **19B—Kenilworth loam, 0 to 4 percent slopes**

#### **Setting**

Landform: Till plains

Slope: 0 to 4 percent

#### **Composition**

##### **Major Components**

Kenilworth and similar soils: 85 percent

##### **Minor Components**

Nunemaker and similar soils: 0 to 7 percent

McKenzie and similar soils: 0 to 1 percent

Elloam and similar soils: 0 to 7 percent

### Major Component Description

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium or eolian material  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 10.5 inches

### Kevin Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landforms:* Till plains or hills  
*Parent material:* Glacial till  
*Slope range:* 0 to 25 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free Season:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed Aridic Argiborolls

### Typical Pedon

Kevin clay loam, 0 to 4 percent slopes, in a cropland area, 500 feet north and 1,580 feet east of the southwest corner of sec. 18, T. 33 N., R. 2 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; many very fine roots and many fine discontinuous pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bt—5 to 9 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; strong coarse prismatic structure parting to strong coarse subangular blocky structure; hard, firm, sticky and plastic; many very fine roots and discontinuous pores; common distinct clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bk1—9 to 24 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine roots and discontinuous pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 40 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse angular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots and common very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—40 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots and common very fine pores; moderately alkaline.

### Range in Characteristics

*Control section:* 5 to 40 inches  
*Mollic epipedon thickness:* 7 to 12 inches  
*Content of clay in the control section:* 27 to 35 percent  
*Depth to Bk horizon:* Less than 10 inches

*Ap horizon*  
 Hue: 10YR, 2.5Y, or 5Y  
 Chroma: 2 or 3  
 Clay content: 27 to 32 percent  
 Reaction: pH 6.6 to 8.4

*Bt horizon*  
 Hue: 10YR, 2.5Y, or 5Y  
 Value: 4 or 5 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Clay loam or clay  
 Clay content: 35 to 45 percent  
 Rock fragments: 0 to 15 percent  
 Reaction: pH 6.6 to 8.4

*Bk horizons*  
 Hue: 10YR, 2.5Y, or 5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Clay content: 27 to 35 percent  
 Rock fragments: 0 to 15 percent pebbles  
 Moist bulk density: 1.6 to 1.8 gram/cm  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0

*C horizon*  
 Hue: 10YR, 5Y, or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Clay content: 27 to 35 percent  
 Rock fragments: 0 to 15 percent  
 Moist bulk density: 1.6 to 1.8 gram/cm  
 Calcium carbonate equivalent: 1 to 10 percent  
 Gypsum: 0 to 2 percent  
 Reaction: pH 7.9 to 9.0  
**Note:** Some pedons have a By horizon.

### **44B—Kevin clay loam, 0 to 4 percent slopes**

#### ***Setting***

Landform: Till plains  
Slope: 0 to 4 percent

#### ***Composition***

##### **Major Components**

Kevin and similar soils: 85 percent

##### **Minor Components**

Soils that have slopes more than 4 percent:  
0 to 5 percent  
Kevin clay loam calcareous: 0 to 5 percent  
Elloam and similar soils: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

### **44C—Kevin clay loam, 4 to 8 percent slopes**

#### ***Setting***

Landform: Till plains  
Slope: 4 to 8 percent

#### ***Composition***

##### **Major Components**

Kevin and similar soils: 85 percent

##### **Minor Components**

Soils that have slopes more than 8 percent:  
0 to 5 percent  
Kevin clay loam calcareous: 0 to 5 percent  
Elloam and similar soils: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None

Available water capacity: 9.8 inches

### **445B—Kevin complex, 0 to 4 percent slopes**

#### ***Setting***

Landforms: Kevin—till plains; Kevin, calcareous—till plains  
Slope: Kevin—0 to 4 percent; Kevin, calcareous—0 to 4 percent

#### ***Composition***

##### **Major Components**

Kevin and similar soils: 50 percent  
Kevin, calcareous and similar soils: 35 percent

##### **Minor Components**

Elloam and similar soils: 0 to 7 percent  
Nishon and similar soils: 0 to 1 percent  
Soils that have slopes more than 4 percent:  
0 to 7 percent

#### ***Major Component Description***

##### **Kevin**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

##### **Kevin, calcareous**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

### **445C—Kevin complex, 4 to 8 percent slopes**

#### ***Setting***

Landforms: Kevin, calcareous—till plains; Kevin—till plains

Position on landform: Kevin, calcareous—back slopes; Kevin—foot slopes  
 Slope: Kevin, calcareous—4 to 8 percent; Kevin—4 to 8 percent

### ***Composition***

#### **Major Components**

Kevin, calcareous and similar soils: 50 percent  
 Kevin and similar soils: 35 percent

#### **Minor Components**

Elloam and similar soils: 0 to 7 percent  
 Nishon and similar soils: 0 to 1 percent  
 Soils that have slopes more than 8 percent: 0 to 7 percent

### ***Major Component Description***

#### **Kevin, calcareous**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.8 inches

#### **Kevin**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.8 inches

### **444B—Kevin, calcareous-Ferd complex, 0 to 4 percent slopes**

#### ***Setting***

Landforms: Kevin, calcareous—till plains; Ferd—till plains  
 Slope: Kevin, calcareous—2 to 4 percent; Ferd—0 to 4 percent

### ***Composition***

#### **Major Components**

Kevin, calcareous and similar soils: 45 percent  
 Ferd and similar soils: 40 percent

#### **Minor Components**

Acel and similar soils: 0 to 13 percent  
 Nishon and similar soils: 0 to 2 percent

### ***Major Component Description***

#### **Kevin, calcareous**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.8 inches

#### **Ferd**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

### **446C—Kevin-Elloam clay loams, 2 to 8 percent slopes**

#### ***Setting***

Landforms: Kevin—till plains; Elloam—till plains  
 Position on landform: Elloam—microlows  
 Slope: Kevin—4 to 8 percent; Elloam—2 to 4 percent

### ***Composition***

#### **Major Components**

Kevin and similar soils: 55 percent  
 Elloam and similar soils: 35 percent

#### **Minor Components**

Kevin clay loam calcareous: 0 to 2 percent  
 Nishon and similar soils: 0 to 2 percent  
 Absher and similar soils: 0 to 2 percent  
 Slickspots: 0 to 2 percent

### ***Major Component Description***

#### **Kevin**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till

Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.8 inches

#### **Elloam**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 6.6 inches

### **443B—Kevin-Ferd complex, 0 to 4 percent slopes**

#### ***Setting***

Landforms: Kevin—till plains; Ferd—till plains  
 Slope: Kevin—2 to 4 percent; Ferd—0 to 2 percent

#### ***Composition***

##### **Major Components**

Kevin and similar soils: 45 percent  
 Ferd and similar soils: 40 percent

##### **Minor Components**

Elloam and similar soils: 0 to 5 percent  
 Nishon and similar soils: 0 to 2 percent  
 Absher and similar soils: 0 to 4 percent  
 Soils that have slopes more than 8 percent:  
 0 to 4 percent

#### ***Major Component Description***

##### **Kevin**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.8 inches

##### **Ferd**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

### **441C—Kevin-Hillon clay loams, 2 to 8 percent slopes**

#### ***Setting***

Landforms: Kevin—till plains; Hillon—till plains  
 Position on landform: Kevin—foot slopes; Hillon—back slopes  
 Slope: Kevin—2 to 4 percent; Hillon—4 to 8 percent

#### ***Composition***

##### **Major Components**

Kevin and similar soils: 55 percent  
 Hillon and similar soils: 35 percent

##### **Minor Components**

Soils that have slopes more than 8 percent:  
 0 to 4 percent  
 Soils that are ponded: 0 to 2 percent  
 Elloam and similar soils: 0 to 4 percent

#### ***Major Component Description***

##### **Kevin**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.8 inches

##### **Hillon**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.9 inches

#### **Kiwanis Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid (2.0 to 6.0 inches/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Typic Ustifluvents

### Typical Pedon

Kiwanis fine sandy loam in an area of Korchea-Kiwanis complex, 0 to 2 percent slopes; in a rangeland area, 600 feet east and 300 feet north of the southwest corner of sec. 5, T. 31 N., R. 9 W.

A1—0 to 5 inches; grayish brown (2.5Y 5/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; many fine and coarse roots; neutral; clear smooth boundary.

A2—5 to 15 inches; light grayish brown (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure; hard, very friable, nonsticky and nonplastic; many fine and coarse roots; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—15 to 29 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine and few coarse roots; slightly effervescent; mildly alkaline; clear wavy boundary.

C2—29 to 36 inches; grayish brown (2.5Y 5/2) sandy loam, very dark grayish brown (2.5Y 3/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine and few coarse roots; slightly effervescent; mildly alkaline; clear wavy boundary.

2C3—36 to 60 inches; grayish brown (2.5Y 5/2) very gravelly sand; very dark grayish brown (2.5Y 3/2) moist; single grain; loose, nonsticky and nonplastic; few fine and medium roots; 40 percent gravels; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 5 to 10 percent

*Depth to 2C horizon:* 20 to 40 inches

#### A horizons

Hue: 7.5YR through 2.5Y

Value: 4, 5, or 6 dry; 2, 3, or 4 moist

Texture: Fine sandy loam or sandy loam

Chroma: 2 or 3

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.8

#### C horizons

Hue: 7.5YR through 2.5Y

Value: 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist

Texture: Coarse loam or sandy loam

Clay content: 5 to 10 percent

Reaction: pH 7.4 to 8.4

### Kobase Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landforms:* Alluvial fans or lake plains

*Parent material:* Alluvium or glaciolacustrine deposits

*Slope range:* 0 to 8 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Borollic Camborthids

### Typical Pedon

Kobase silty clay loam, 0 to 4 percent slopes, in a cropland area, 350 feet north and 2,500 feet west of the southeast corner of sec. 12, T. 33 N., R. 4 W.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and vesicular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—5 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; many very fine and fine roots and tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—12 to 18 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; common very fine and fine roots and many fine tubular pores; few medium soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—18 to 28 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 5/2) moist; weak medium angular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots and common fine tubular pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

By—28 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist;

massive; very hard, firm, sticky and plastic; few fine nests of gypsum; strongly effervescent; moderately alkaline.

#### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 45 percent

*Depth to Bk horizon:* 12 to 17 inches

*Depth to the By horizon:* 25 to 40 inches

#### **Ap horizon**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Reaction: pH 6.6 to 8.4

#### **Bw horizon**

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Reaction: pH 7.4 to 8.4

#### **Bk1 horizon**

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 1, 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

#### **Bk2 horizon**

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: 7.9 to 9.0

#### **By horizon**

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 1, 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

**Note:** Some pedons have thin strata of silt loam or loam below depths of 40 inches and a BCy or Byz horizon.

### **32B—Kobase silty clay loam, 0 to 4 percent slopes**

#### **Setting**

Landform: Alluvial fans

Slope: 0 to 4 percent

#### **Composition**

#### **Major Components**

Kobase and similar soils: 85 percent

#### **Minor Components**

Kobar, calcareous: 0 to 8 percent

McKenzie and similar soils: 0 to 2 percent

Marvan and similar soils: 0 to 3 percent

Vanda and similar soils: 0 to 2 percent

#### **Major Component Description**

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

### **32C—Kobase silty clay loam, 4 to 8 percent slopes**

#### **Setting**

Landform: Alluvial fans

Slope: 4 to 8 percent

#### **Composition**

#### **Major Components**

Kobase and similar soils: 85 percent

#### **Minor Components**

Trudau and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 5 percent

#### **Major Component Description**

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

### 321B—Kobase silty clay loam, calcareous, 0 to 4 percent slopes

#### *Setting*

Landform: Alluvial fans  
Slope: 0 to 4 percent

#### *Composition*

##### **Major Components**

Kobase and similar soils: 85 percent

##### **Minor Components**

Marvan and similar soils: 0 to 5 percent  
Vanda and similar soils: 0 to 5 percent  
Soils that have noncalcareous surface layers: 0 to 5 percent

#### *Major Component Description*

Surface layer texture: Silty clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

### 321C—Kobase silty clay loam, calcareous, 4 to 8 percent slopes

#### *Setting*

Landform: Alluvial fans  
Slope: 4 to 8 percent

#### *Composition*

##### **Major Components**

Kobase and similar soils: 85 percent

##### **Minor Components**

Soils that have noncalcareous surface layers: 0 to 5 percent  
Soils that have slopes less than 4 percent: 0 to 4 percent  
Marvan and similar soils: 0 to 3 percent  
Vanda and similar soils: 0 to 3 percent

#### *Major Component Description*

Surface layer texture: Silty clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland

Flooding: None  
Available water capacity: 9.8 inches

### **Korchea Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents

#### **Typical Pedon**

Korchea loam in an area of Korchea-Kiwanis complex, 0 to 2 percent slopes; in a rangeland area, 1,300 feet south and 1,200 feet east of the northwest corner of sec. 20, T. 31 N., R. 8 W.

A1—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; slightly effervescent; mildly alkaline; gradual wavy boundary.

A2—7 to 14 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; slightly hard, very friable, nonsticky and nonplastic; slightly effervescent; mildly alkaline; gradual smooth boundary.

C1—14 to 24 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—24 to 37 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3—37 to 60 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; few medium distinct light olive brown (2.5Y 6/4) or light yellowish brown (2.5Y 5/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.



### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 18 to 27 percent

#### *A horizon*

Hue: 10YR or 2.5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

#### *C horizons*

Hue: 2.5Y or 10YR, but 5Y is in the range

Value: 4, 5, 6, or 7 dry; 3, 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, silty clay loam, clay loam, fine sandy loam, sandy loam, or very fine sandy loam

Clay content: 18 to 35 percent

Reaction: pH 7.4 to 9.0

**Note:** Layers of coarser or finer textures are in some pedons at depths of 40 to 60 inches.

### 110A—Korchea-Kiwanis complex, 0 to 2 percent slopes

#### **Setting**

Landforms: Korchea—flood plains; Kiwanis—flood plains

Slope: Korchea—0 to 2 percent; Kiwanis—0 to 2 percent

#### **Composition**

##### **Major Components**

Korchea and similar soils: 45 percent

Kiwanis and similar soils: 45 percent

##### **Minor Components**

Areas of riverwash: 0 to 3 percent

Bigsandy and similar soils: 0 to 5 percent

Nesda and similar soils: 0 to 2 percent

#### **Major Component Description**

##### **Korchea**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 10.1 inches

##### **Kiwanis**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 5.8 inches

### Kremlin Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)

*Landform:* Alluvial fans

*Parent material:* Alluvium

*Slope range:* 0 to 4 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed Aridic Haploborolls

#### **Typical Pedon**

Kremlin loam, 0 to 4 percent slopes, in a cropland area, 2,410 feet north and 10 feet west of the southeast corner of sec. 35, T. 32 N., R. 1 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; mildly alkaline; abrupt smooth boundary.

Bw—7 to 16 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium prismatic structure; hard, friable, slightly sticky and plastic; few very fine roots and discontinuous pores; mildly alkaline; clear wavy boundary.

Bk1—16 to 27 inches; light brownish gray (10YR 6/2) loam, brown (10YR 4/3) moist; weak medium prismatic structure; hard, friable, sticky and plastic; few very fine roots and discontinuous pores; few fine rounded soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—27 to 40 inches; light brownish gray (10YR 6/2) loam, brown (10YR 5/3) moist; weak medium prismatic structure; hard, friable, sticky and plastic; few very fine roots and discontinuous pores; common fine rounded soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—40 to 60 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 5/3) moist; weak coarse angular blocky structure; hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 7 to 15 inches; in some pedons it includes all or part of the Bw1 horizon

*Content of clay in the control section:* 18 to 30 percent

*Depth to Bk horizon:* 10 to 24 inches

#### Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 5 to 15 percent for calcareous phase

Reaction: pH 6.1 to 7.8

#### Bw horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, silt loam, clay loam, or sandy clay loam

Clay content: 18 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent for the calcareous phase

Reaction: pH 6.6 to 7.8

#### Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam, silt loam, clay loam, or sandy clay loam

Clay content: 18 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### Bk2 and BC horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, clay loam, or sandy clay loam

Clay content: 18 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

## 98B—Kremlin loam, 0 to 4 percent slopes

### Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

### Composition

#### Major Components

Kremlin and similar soils: 85 percent

#### Minor Components

Kremlin loam calcareous: 0 to 3 percent

Trudau and similar soils: 0 to 3 percent

Chinook and similar soils: 0 to 3 percent

Yamac and similar soils: 0 to 3 percent

Evanston and similar soils: 0 to 3 percent

### Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.4 inches

## Lambeth Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderately slow (0.2 to 0.6 inch/hour)

*Landforms:* Hills or escarpments

*Parent material:* Glaciofluvial or glaciolacustrine deposits

*Slope range:* 15 to 70 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-silty, mixed (calcareous), frigid Aridic Ustorthents

### Typical Pedon

Lambeth silt loam, in an area of Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes; in a rangeland area, 1,000 feet north and 500 feet west of the southeast corner of sec. 16, T. 30 N., R. 1 W.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (10YR 5/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and plastic; common fine roots

and few very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

By1—4 to 9 inches; pale yellow (2.5Y 7/4) silt loam, brown (10YR 5/3) moist; moderate medium platy structure; slightly hard, very friable, slightly sticky and plastic; few fine roots and very fine pores; common medium threads of gypsum; strongly effervescent; moderately alkaline; gradual wavy boundary.

By2—9 to 60 inches; pale yellow (2.5Y 7/4) silt loam, brown (10YR 5/3) moist; moderate thick platy structure; slightly hard, very friable, slightly sticky and plastic; few very fine roots and pores; common medium threads of gypsum; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 20 to 35 percent

#### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 8.4

#### By horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam with thin bands of loam, fine sandy loam, or very fine sandy loam

Clay content: 20 to 35 percent

Gypsum: 1 to 6 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

**Note:** Some pedons have a Bk or Bky horizon; the bands are remnants from lacustrine sediments.

### 15F—Lambeth silt loam, 15 to 70 percent slopes

#### Setting

Landform: Hills

Slope: 15 to 70 percent

#### Composition

#### Major Components

Lambeth and similar soils: 85 percent

#### Minor Components

Lonna and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

#### Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 11.4 inches

#### Lihen Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Somewhat excessively drained

*Permeability:* Rapid (6.0 to 20.0 inches/hour)

*Landforms:* Alluvial fans or hills

*Parent material:* Alluvium or eolian deposits

*Slope range:* 0 to 25 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Sandy, mixed Entic Haploborolls

#### Typical Pedon

Lihen loamy sand in an area of Lihen-Blanchard loamy sands, 8 to 25 percent slopes; in a rangeland area, 2,200 feet south and 1,700 feet west of the northeast corner of sec. 19, T. 36 N., R. 2 E.

A1—0 to 5 inches; brown (10YR 4/3) loamy sand; dark brown (10YR 3/3) moist; moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and pores; neutral; abrupt smooth boundary.

A2—5 to 10 inches; very dark grayish brown (10YR 3/2) loamy sand; brown (10YR 5/3) moist; moderate fine prismatic structure; soft, very friable, nonsticky and nonplastic; common very fine roots and pores; neutral; clear smooth boundary.

AC—10 to 30 inches; brown (10YR 4/3) loamy sand; dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots and pores; neutral; gradual wavy boundary.

C—30 to 60 inches; light yellowish brown (2.5Y 6/4) sand; olive brown (2.5Y 4/4) moist; single grain;

loose, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 12 to 30 inches

*Content of clay in the control section:* 0 to 10 percent

#### A horizons

Hue: 10YR or 2.5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loamy sand (textures of fine sandy loam do not extend below a depth of 9 inches)

Clay content: 5 to 20 percent

Reaction: pH 6.1 to 8.4

#### AC horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loamy fine sand, loamy sand, fine sand, or sand

Clay content: 0 to 10 percent

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 7.4 to 8.4

#### C horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loamy fine sand, loamy sand, fine sand, or sand

Clay content: 0 to 10 percent

Calcium carbonate equivalent: 0 to 12 percent

Reaction: pH 7.4 to 8.4

## 551E—Lihen-Blanchard loamy sands, 8 to 25 percent slopes

### Setting

Landforms: Lihen—hills; Blanchard—hills

Position on landform: Lihen—back slopes; Blanchard—shoulders

Slope: Lihen—8 to 25 percent; Blanchard—8 to 25 percent

### Composition

#### Major Components

Lihen and similar soils: 50 percent

Blanchard and similar soils: 35 percent

#### Minor Components

Soils that have slopes less than 8 percent: 0 to 10 percent

Soils that have loam surface layers: 0 to 5 percent

### Major Component Description

#### Lihen

Surface layer texture: Loamy sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.1 inches

#### Blanchard

Surface layer texture: Loamy sand

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.0 inches

### Lonna Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)

*Landform:* Alluvial fans

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-silty, mixed, frigid Aridic Ustochrepts

### Typical Pedon

Lonna silty clay loam, 4 to 8 percent slopes, in a cropland area, 3,600 feet south and 300 feet east of the northwest corner of sec. 21, T. 34 N., R. 3 W.

Ap—0 to 5 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and many very fine pores;

strongly effervescent; moderately alkaline; abrupt smooth boundary.

**Bw**—5 to 11 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots, common very fine and fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

**Bk**—11 to 35 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and common very fine and fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

**C**—35 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots and common very fine and fine pores; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 18 to 35 percent

#### *Ap horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

**Note:** Uncultivated areas have A horizons 2 to 4 inches thick.

#### *Bw horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

**Note:** This horizon may be noneffervescent in some pedons.

#### *Bk horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 8.4

#### *BC horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Very fine sandy loam, loam, silt loam, or silty clay loam (may be stratified)

Clay content: 10 to 35 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 8.4

### 58B—Lonna silt loam, 0 to 4 percent slopes

#### *Setting*

Landform: Alluvial fans

Slope: 0 to 4 percent

#### *Composition*

##### **Major Components**

Lonna and similar soils: 85 percent

##### **Minor Components**

Soils that have slopes more than 4 percent:  
0 to 4 percent

Lonna silt loam calcareous: 0 to 4 percent

Ferd and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 3 percent

#### *Major Component Description*

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.8 inches

### 581B—Lonna silty clay loam, 0 to 4 percent slopes

#### *Setting*

Landform: Alluvial fans

Slope: 0 to 4 percent

**Composition****Major Components**

Lonna and similar soils: 85 percent

**Minor Components**

Soils that have noncalcareous surface layers:  
0 to 10 percent

Busby and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Silty clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 8.8 inches

**581C—Lonna silty clay loam, 4 to 8 percent slopes****Setting**

Landform: Alluvial fans

Slope: 4 to 8 percent

**Composition****Major Components**

Lonna and similar soils: 85 percent

**Minor Components**

Soils that have noncalcareous surface layers: 0 to 10 percent

Busby and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Silty clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 8.8 inches

**582B—Lonna-Ethridge complex, 0 to 4 percent slopes****Setting**

Landforms: Lonna—alluvial fans; Ethridge—alluvial fans

Slope: Lonna—0 to 4 percent; Ethridge—0 to 4 percent

**Composition****Major Components**

Lonna and similar soils: 45 percent

Ethridge and similar soils: 40 percent

**Minor Components**

Busby and similar soils: 0 to 8 percent

Marias and similar soils: 0 to 7 percent

**Major Component Description****Lonna**

Surface layer texture: Silt loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 8.8 inches

**Ethridge**

Surface layer texture: Silty clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

**Macar Series**

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)

*Landform:* Alluvial fans

*Parent material:* Alluvium

*Slope range:* 0 to 15 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed, frigid Typic Ustochrepts

**Typical Pedon**

Macar loam, 8 to 15 percent slopes, in a cropland area, 2,200 feet north and 2,350 feet west of the southeast corner of sec. 14, T. 37 N., R. 3 W.

**Ap**—0 to 6 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; mildly alkaline; abrupt smooth boundary.

**Bw**—6 to 12 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and tubular pores; slightly effervescent; mildly alkaline; clear smooth boundary.

**Bk1**—12 to 16 inches; brown (10YR 5/3) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and pores; strongly effervescent; few medium soft masses of lime; moderately alkaline; gradual wavy boundary.

**Bk2**—16 to 26 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 5/2) moist; weak fine medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; violently effervescent; common fine soft masses of lime; moderately alkaline; diffuse wavy boundary.

**Bky**—26 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots and common very fine and fine pores; violently effervescent; few fine soft masses of lime; few fine soft masses of gypsum; moderately alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 18 to 35 percent

*Depth to Bk horizon:* 11 to 24 inches

#### *Ap horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

**Note:** A thin dark colored A horizon that does not meet the requirements for a mollic epipedon after mixing to 7 inches is allowed.

#### *Bw horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2, 3, 4, or 6

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 9.0; saline phase pH 8.5 to 9.0.

#### *Bk1 horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, 4, or 6

Texture: Clay loam, loam, or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.4 to 9.0

#### *Bk2 horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, 4, or 6

Texture: Clay loam, loam, silt loam, sandy clay loam, or silty clay loam (some fine strata of sandy loam and fine sandy loam are in some pedons)

Clay content: 18 to 35 percent—35 to 55 percent fine sand and coarser

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.4 to 9.0

#### *BC horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, 4, or 6

Texture: Loam, silt loam or silty clay loam consisting of strata of very fine sandy loam, sandy clay loam, and silt loam

Clay content: 15 to 30 percent

Calcium carbonate equivalent: 5 to 12 percent

Reaction: pH 7.9 to 9.0

### 961B—Macar clay loam, 0 to 4 percent slopes

#### *Setting*

Landform: Alluvial fans

Slope: 0 to 4 percent

#### *Composition*

#### **Major Components**

Macar and similar soils: 85 percent

#### **Minor Components**

Soils that have noncalcareous surface layers:

0 to 8 percent

Bigsandy and similar soils: 0 to 2 percent

Blanchard and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.9 inches

**96C—Macar loam, 4 to 8 percent slopes****Setting**

Landform: Alluvial fans  
 Slope: 4 to 8 percent

**Composition****Major Components**

Macar and similar soils: 85 percent

**Minor Components**

Macar loam calcareous: 0 to 10 percent  
 Daglum and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.7 inches

**96D—Macar loam, 8 to 15 percent slopes****Setting**

Landform: Alluvial fans  
 Slope: 8 to 15 percent

**Composition****Major Components**

Macar and similar soils: 85 percent

**Minor Components**

Macar loam calcareous: 0 to 10 percent  
 Daglum and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)

Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.7 inches

**Marias Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Very slow (less than 0.06 inch/hour)  
*Landforms:* Alluvial fans or lake plains  
*Parent material:* Glaciofluvial or glaciolacustrine deposits  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic, frigid  
 Chromic Udic Haplusterts

**Typical Pedon**

Marias silty clay, 0 to 4 percent slopes, in a cropland area, 250 feet south and 2,500 feet east of the northwest corner of sec. 36, T. 32 N., R. 2 W.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate fine granular structure; hard, firm, sticky and plastic; common very fine roots and continuous pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.  
 Bss1—5 to 10 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong very fine and fine angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots and continuous pores; common slickensides intersecting at 40 degrees from horizontal; mildly alkaline; clear smooth boundary.  
 Bss2—10 to 23 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots and common fine continuous pores; common slickensides intersecting at 40 degrees from horizontal; slightly effervescent; moderately alkaline; clear smooth boundary.  
 Bkss—23 to 27 inches; light grayish brown (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine prismatic structure; hard, firm, sticky and plastic; common very fine roots and common fine tubular pores; common slickensides intersecting at 40 degrees from horizontal;



common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**Bssy**—27 to 60 inches; dark grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 4/2) moist; strong fine and medium angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few very fine roots and pores; common slickensides intersecting at 40 degrees from horizontal; common fine and medium soft masses and seams of gypsum; slightly effervescent; moderately alkaline.

#### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 40 to 60 percent

*Depth to the Bssy horizon:* 20 to 45 inches

#### *Ap horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4.

#### *Bss and Bkss horizons*

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay or silty clay

Clay content: 35 to 60 percent clay

Slickensides: Common to many

Electrical conductivity: 2 to 4

Reaction: pH 7.9 to 9.0

#### *Bssy horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Texture: Clay or silty clay

Clay content: 35 to 60

Gypsum: 1 to 6 percent

Electrical conductivity: 2 to 4 mmhos/cm above a depth of 30 inches and 2 to 8 mmhos/cm below

Reaction: pH 7.9 to 9.0

### **47B—Marias silty clay, 0 to 4 percent slopes**

#### ***Setting***

Landform: Alluvial fans

Slope: 0 to 4 percent

### ***Composition***

#### **Major Components**

Marias and similar soils: 90 percent

#### **Minor Components**

Ethridge and similar soils: 0 to 4 percent

McKenzie and similar soils: 0 to 2 percent

Kobar and similar soils: 0 to 4 percent

#### ***Major Component Description***

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.5 inches

### **Marmarth Series**

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)

*Landforms:* Sedimentary plains or till plains

*Parent material:* Residuum weathered from semiconsolidated sandstone or in glacial till materials deposited over these soft sedimentary beds

*Slope range:* 4 to 8 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed Aridic Argiborolls

#### **Typical Pedon**

Marmarth loam in an area of Marmarth-Evanston loams, 0 to 8 percent slopes; in a rangeland area, 3,000 feet east and 500 feet south of the northwest corner of sec. 23, T. 36 N., R. 1 W.

**A**—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and many very fine pores; neutral; clear wavy boundary.

**Bt1**—3 to 8 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common distinct

clay films on faces of peds; common very fine and fine roots and many very fine pores; neutral; clear wavy boundary.

**Bt2**—8 to 11 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine pores; few faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

**Bk**—11 to 24 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and many very fine pores; many fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

**C**—24 to 32 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; loose, nonsticky and nonplastic; few very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

**Cr**—32 to 60 inches; light yellowish brown (2.5Y 6/4) semiconsolidated sandstone, light olive brown (2.5Y 5/4) moist; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 3 to 11 inches

*Mollic epipedon thickness:* 7 to 12 inches

*Content of clay in the control section:* 18 to 35 percent

*Depth to semiconsolidated bedrock:* 20 to 40 inches

*Depth to Bk horizon:* 10 to 20 inches

#### A horizon

Hue: 10YR

Value: 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Reaction: pH 6.1 to 7.3

#### Bt horizons

Hue: 10YR or 2.5Y

Value: 3, 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or sandy clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.1 to 7.8

#### Bk and C horizons

Hue: 2.5Y or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, fine sandy loam, or clay loam

Clay content: 15 to 35 percent

Reaction: pH 7.4 to 8.4

#### Cr horizon

Texture: Soft sandstone or stratified soft sandstone and siltstone

Reaction: pH 7.4 to 8.4

### 241C—Marmarth-Evanston loams, 0 to 8 percent slopes

#### Setting

Landforms: Marmarth—sedimentary plains;

Evanston—drainageways

Slope: Marmarth—4 to 8 percent; Evanston—0 to 4 percent

#### Composition

##### Major Components

Marmarth and similar soils: 50 percent

Evanston and similar soils: 35 percent

##### Minor Components

Soils that have slopes more than 8 percent:  
0 to 8 percent

McKenzie and similar soils: 0 to 1 percent

Gerdrum and similar soils: 0 to 3 percent

Absher and similar soils: 0 to 3 percent

#### Major Component Description

##### Marmarth

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.2 inches

##### Evanston

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.0 inches

## Marvan Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Very slow (less than 0.06 inch/hour)

*Landforms:* Alluvial fans or lake plains

*Parent material:* Alluvium or glaciolacustrine deposits

*Slope range:* 0 to 8 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic, frigid  
Sodic Haplusterts

### Typical Pedon

Marvan silty clay, 0 to 4 percent slopes, in a cropland area, 1,400 feet west and 2,400 feet south of the northeast corner of sec. 6, T. 33 N., R. 3 W.

Ap—0 to 7 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; very hard, firm, very sticky and very plastic; many very fine and fine roots and many fine pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bss—7 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine and fine roots and pores; few slickensides intersecting at 40 degrees from horizontal; strongly effervescent; strongly alkaline; clear wavy boundary.

Bssyz—23 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; common fine roots and pores; few slickensides intersecting at 40 degrees from horizontal; few fine soft masses and nests of gypsum and other salts; strongly effervescent; strongly alkaline; clear wavy boundary.

Bnyz—30 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, very sticky and very plastic; few fine roots and few very fine and fine pores; few common soft masses and nests of gypsum and other salts; strongly effervescent; strongly alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 45 to 60 percent

*Depth to the Bssyz horizon:* 10 to 24 inches

#### Ap horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 2 to 8 mmhos/cm

Sodium absorption ratio: 8 to 18 above a depth of 24 inches and 13 to 38 below that depth; where the SAR is 8 or less, the sodium plus magnesium is greater than calcium plus acidity

Reaction: pH 7.4 to 9.0

#### Bss horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay or silty clay

Clay content: 45 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium absorption ratio: 8 to 18; where the SAR is below 8, the sodium plus magnesium is greater than calcium plus acidity

Reaction: pH 7.9 to 9.0

#### Bssyz horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay or silty clay

Clay content: 45 to 60 percent

Gypsum: 1 to 5 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium absorption ratio: 8 to 18 above a depth of 24 inches and 13 to 38 below that depth; where the SAR is below 8, the sodium plus magnesium is greater than calcium plus acidity

Reaction: pH 7.9 to 9.0

#### Bnyz horizon

Hue: 2.5 or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay or silty clay that includes thin layers of silty clay loam and silt loam material

Clay content: 45 to 60 percent

Gypsum: 1 to 5 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 38

Reaction: pH 7.9 to 9.0

**Note:** Some pedons have a Bssyz horizon in place of the Bnyz horizon. When dry the soil has 1/4- to 1-inch cracks that extend to a depth of about 20 inches.

### **30B—Marvan silty clay, 0 to 4 percent slopes**

#### ***Setting***

Landform: Alluvial fans

Slope: 0 to 4 percent

#### ***Composition***

##### **Major Components**

Marvan and similar soils: 85 percent

##### **Minor Components**

Vanda and similar soils: 0 to 5 percent

Yamac and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.9 inches

### **30C—Marvan silty clay, 4 to 8 percent slopes**

#### ***Setting***

Landform: Alluvial fans

Slope: 4 to 8 percent

#### ***Composition***

##### **Major Components**

Marvan and similar soils: 85 percent

##### **Minor Components**

Vanda and similar soils: 0 to 5 percent

Yamac and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.9 inches

### **McKenzie Series**

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Poorly drained

*Permeability:* Very slow (less than 0.06 inch/hour)

*Landform:* Closed depressions

*Parent material:* Alluvium or glaciolacustrine deposits

*Slope range:* 0 to 2 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic, frigid  
Chromic Endoaquerts

#### ***Typical Pedon***

McKenzie silty clay, 0 to 1 percent slope, in a rangeland area, 2,000 feet north and 1,400 feet east of the southwest corner of sec. 16, T. 33 N., R. 3 W.

A—0 to 4 inches; light gray (10YR 6/1) silty clay, dark gray (10YR 4/1) moist; common fine and medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine, fine, and medium roots, common very fine and fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bw—4 to 12 inches; light gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; many fine and medium distinct dark brown (10YR 3/3) mottles; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; common fine roots and common very fine and fine pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Byz1—12 to 24 inches; light grayish brown (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; many fine and medium distinct dark brown (10YR 3/3) mottles; weak medium subangular blocky structure; very hard, firm, very sticky and very

plastic; few fine roots and few very fine and fine pores; common fine and medium soft masses of gypsum and other salts; slightly effervescent; strongly alkaline; clear smooth boundary.

Byz2—24 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; many fine and medium distinct dark brown (10YR 3/3) mottles; massive; very hard, firm, very sticky and very plastic; many fine soft masses of gypsum and other salts; slightly effervescent; moderately alkaline.

#### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 40 to 60 percent

*Depth to seasonal high water table:* +.5 to 1 foot

*Depth to the Byz horizon:* 10 to 20 inches

#### *A horizon*

Hue: 5Y, 2.5Y, or 10YR

Value: 4 or 5 moist; 4, 5, or 6 dry

Chroma: 1 or 2

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 16 mmhos/cm; saline phase is 8 to 16

Reaction: pH 6.6 to 9.0

**Note:** The upper 1/16- to 1-inch is commonly a light gray vesicular crust.

#### *Bw horizon*

Hue: 2.5Y or 5Y

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 1 or 2

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 16 mmhos/cm; saline phase is 8 to 16

Reaction: pH 7.9 to 9.0

#### *Byz horizons*

Hue: 2.5Y or 5Y

Value: 4, 5, or 6 moist; 5, 6, or 7 dry

Chroma: 1, 2, or 3

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 16 mmhos/cm; saline phase is 8 to 16

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

**Note:** Some pedons do not have a Byz horizons.

### **141A—McKenzie clay, saline, 0 to 2 percent slopes**

#### ***Setting***

Landform: Closed depressions

Slope: 0 to 2 percent

#### ***Composition***

#### **Major Components**

McKenzie and similar soils: 85 percent

#### **Minor Components**

Slickspots: 0 to 10 percent

McKenzie clay: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Ponding: Long

Salt affected: Saline within 30 inches

Available water capacity: 4.5 inches

### **14A—McKenzie silty clay, 0 to 1 percent slopes**

#### ***Setting***

Landform: Closed depressions

Slope: 0 to 1 percent

#### ***Composition***

#### **Major Components**

McKenzie and similar soils: 90 percent

#### **Minor Components**

Soils that are silt loam: 0 to 5 percent

McKenzie silty clay saline: 0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Ponding: Long

Salt affected: Saline within 30 inches  
Available water capacity: 9.0 inches

## Meadowcreek Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Somewhat poorly drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy over sandy or sandy-skeletal, mixed Fluvaquentic Haploborolls

### Typical Pedon

Meadowcreek loam, 0 to 2 percent slopes, in a rangeland area, 650 feet south and 2,450 feet east of the northwest corner of sec. 16, T. 37 N., R. 2 E.

A1—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/2) moist; strong very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and many very fine and fine pores; slightly effervescent; mildly alkaline; gradual wavy boundary.

A2—9 to 16 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 2/1) moist; weak fine prismatic structure parting to moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine tubular pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bw—16 to 21 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine prismatic structure parting to moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine tubular pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

2Cg—21 to 60 inches; light gray (2.5Y 7/2) extremely gravelly loamy sand, grayish brown (2.5Y 5/2) moist; common fine distinct dark brown (10YR 3/3) mottles; single grain; loose, nonsticky and nonplastic; 75 percent pebbles; strongly effervescent; neutral.

### Range in Characteristics

*Control section:* 10 to 40 inches  
*Mollic epipedon thickness:* 10 to 16 inches  
*Depth to seasonal high water table:* 36 to 60 inches  
*Depth to 2C horizon:* 20 to 35 inches

#### A horizons

Hue: 10YR or 2.5Y  
Value: 4 or 5 dry; 2 or 3 moist  
Chroma: 1 or 2  
Clay content: 18 to 25 percent  
Calcium carbonate equivalent: 0 to 10 percent  
Reaction: pH 7.4 to 8.4

#### Bw horizon

Hue: 10YR, 2.5Y, or 5Y  
Value: 5 or 6 dry; 3 or 4 moist  
Chroma: 1, 2, or 3  
Texture: Loam, sandy loam, sandy clay loam, or silt loam  
Clay content: 18 to 25 percent  
Calcium carbonate equivalent: 0 to 10 percent  
Reaction: pH 6.6 to 8.4

**Note:** Mottles may be a different color than the ranges given; some pedons have thin strata of fine sandy loam.

#### 2Cg horizon

Hue: 2.5Y or 5Y  
Texture: Sand or loamy sand  
Clay content: 0 to 10 percent  
Rock fragments: 50 to 75 percent—0 to 15 percent cobbles and stones, 50 to 70 percent pebbles  
Reaction: pH 6.1 to 7.8

### 143A—Meadowcreek loam, 0 to 2 percent slopes

#### Setting

Landform: Flood plains  
Slope: 0 to 2 percent

#### Composition

#### Major Components

Meadowcreek and similar soils: 85 percent

#### Minor Components

Enbar and similar soils: 0 to 5 percent  
Bigsandy and similar soils: 0 to 5 percent  
Korchea and similar soils: 0 to 5 percent

### **Major Component Description**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Somewhat poorly drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: Rare  
 Water table: Apparent  
 Available water capacity: 4.7 inches

## **M-W—Miscellaneous Water**

### **Composition**

#### **Major Components**

Miscellaneous water: 100 percent

### **Major Component Description**

*Definition:* Areas of open water in sewage lagoons, industrial waste pits, fish hatcheries, etc.

## **Neldore Series**

*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landforms:* Hills or escarpments  
*Parent material:* Residuum weathered from shale  
*Slope range:* 2 to 70 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents

### **Typical Pedon**

Neldore clay in an area of Hillon-Neldore complex, 8 to 25 percent slopes; in a rangeland area, 2,500 feet south and 2,100 feet west of the northeast corner of sec. 27, T. 33 N., R. 3 W.

A—0 to 6 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, very firm, sticky and plastic; few very fine roots and few very fine discontinuous pores; strongly effervescent; mildly alkaline; clear smooth boundary.

C—6 to 18 inches; gray (10YR 5/1) clay, dark brown (10YR 4/2) moist; weak medium subangular blocky structure parting to weak fine granular

structure; hard, very firm, sticky and plastic; few very fine roots and pores; common fine soft masses of lime; common medium nests of gypsum and other soluble salts; violently effervescent; mildly alkaline; gradual wavy boundary.

Cr—18 to 60 inches; gray (10YR 5/1) semiconsolidated shale, very dark gray (10YR 3/1) moist; neutral.

### **Range in Characteristics**

*Control section:* 10 to 18 inches

*Content of clay in the control section:* 40 to 60 percent

*Depth to semiconsolidated bedrock:* 10 to 20 inches

#### **A horizon**

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 1 or 2

Clay content: 40 to 50 percent

Rock fragments: 0 to 10 percent—0 to 5 percent stones and cobbles, 0 to 5 percent pebbles; the stones, cobbles, and pebbles in some pedons are from a thin glacial mantle that has been eroded away.

Reaction: pH 5.6 to 7.8

#### **C horizon**

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 4, or 6 for stains of shale

Texture: Clay or silt clay

Clay content: 40 to 60 percent

Rock fragments: 5 to 35 percent—5 to 25 percent soft shale fragments, 0 to 10 percent hard shale fragments

Reaction: pH 5.6 through 7.8

#### **Cr horizon**

**Note:** The shale fragments are extremely hard or very hard when dry and extremely firm or very firm when moist.

Reaction: pH 5.1 through 7.3.

## **971C—Neldore-Bascovy clays, 2 to 8 percent slopes**

### **Setting**

Landforms: Neldore—sedimentary plains; Bascovy—sedimentary plains

Position on landform: Neldore—back slopes; Bascovy—foot slopes



Figure 4. Typical area of Neldore-Bascovy clays, 2 to 8 percent slopes. Neldore and similar soils: 45 percent.

Slope: Neldore—2 to 8 percent; Bascovy—2 to 8 percent

### ***Composition***

#### **Major Components**

Neldore and similar soils: 45 percent (fig. 4)  
Bascovy and similar soils: 40 percent

#### **Minor Components**

Soils that have slopes more than 8 percent:  
0 to 5 percent  
Marias and similar soils: 0 to 5 percent  
Marvan and similar soils: 0 to 5 percent

### ***Major Component Description***

#### **Neldore**

Surface layer texture: Clay  
Depth class: Shallow (10 to 20 inches)  
Drainage class: Well drained

Dominant parent material: Shale residuum  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 2.6 inches

#### **Bascovy**

Surface layer texture: Clay  
Depth class: Moderately deep (20 to 40 inches)  
Drainage class: Well drained  
Dominant parent material: Shale residuum  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 4.5 inches

### **971F—Neldore-Bascovy clays, 8 to 45 percent slopes**

### ***Setting***

Landforms: Neldore—hills; Bascovy—hills



Position on landform: Neldore—shoulders; Bascovy—back slopes

Slope: Neldore—8 to 45 percent; Bascovy—8 to 45 percent

### ***Composition***

#### **Major Components**

Bascovy and similar soils: 35 percent

#### **Minor Components**

Soils that have slopes less than 8 percent: 0 to 5 percent

Marvan and similar soils: 0 to 5 percent

Vanda and similar soils: 0 to 5 percent

### ***Major Component Description***

#### **Neldore**

Surface layer texture: Clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.6 inches

#### **Bascovy**

Surface layer texture: Clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.5 inches

### **972F—Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes**

### ***Setting***

Landforms: Neldore—hills; Lambeth—hills

Position on landform: Neldore—back slopes; Lambeth—foot slopes

Slope: Neldore—35 to 70 percent; Lambeth—35 to 70 percent; Rock outcrop—35 to 70 percent

### ***Composition***

#### **Major Components**

Neldore and similar soils: 35 percent

Lambeth and similar soils: 30 percent

Rock outcrop: 20 percent

#### **Minor Components**

Soils that have slopes less than 35 percent:

0 to 5 percent

Bascovy and similar soils: 0 to 5 percent

Cabbart and similar soils: 0 to 3 percent

Fleak and similar soils: 0 to 2 percent

### ***Major Component Description***

#### **Neldore**

Surface layer texture: Clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.6 inches

#### **Lambeth**

*Definition:* Surface exposures bare bedrock

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 11.4 inches

#### **Rock outcrop**

*Definition:* Surface exposures bare bedrock

### **Nesda Series**

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Rapid (6.0 to 20.0 inches/hour)

*Landforms:* Flood plains or stream channels

*Parent material:* Alluvium

*Slope range:* 0 to 4 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Sandy-skeletal, mixed

Fluventic Haploborolls

### **Typical Pedon**

Nesda gravelly loam in an area of Nesda complex, 0 to 4 percent slopes, in a rangeland area, 300 feet south and 300 feet west of the northeast corner of sec. 11, T. 36 N., R. 1 E.

A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 25 percent pebbles; neutral; clear smooth boundary.

A2—5 to 12 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to weak fine granular structure; soft, very friable; slightly sticky and slightly plastic; many very fine and fine roots and pores; 25 percent pebbles; neutral; clear smooth boundary.

2C1—12 to 17 inches; very pale brown (10YR 7/3) very gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; 30 percent pebbles; mildly alkaline; clear wavy boundary.

2C2—17 to 60 inches; light gray (10YR 7/2) very gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots; 45 percent pebbles; mildly alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 10 to 16 inches

*Content of clay in the control section:* 0 to 10 percent

*Depth to 2C horizon:* 10 to 20 inches

#### A horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 1, 2, or 3

Clay content: 10 to 20 percent

Rock fragments: 0 to 65 percent—0 to 15 percent stones and cobbles, 0 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

#### 2C horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, 3, or 4

Texture: Sand or loamy sand

Clay content: 0 to 10 percent

Rock fragments: 35 to 80 percent—0 to 15 percent stones and cobbles, 35 to 65 percent pebbles

Reaction: pH 7.4 to 8.4

**Note:** Some pedons have a buried A horizon above a depth of 40 inches.

### 871B—Nesda complex, 0 to 4 percent slopes

#### Setting

Landforms: Nesda—flood plains; Nesda, cool—stream channels

Slope: Nesda—0 to 4 percent; Nesda, cool—0 to 4 percent

#### Composition

##### Major Components

Nesda and similar soils: 45 percent

Nesda, cool and similar soils: 40 percent

##### Minor Components

Bigsandy and similar soils: 0 to 5 percent

Kiwanis and similar soils: 0 to 5 percent

Areas of riverwash: 0 to 5 percent

#### Major Component Description

##### Nesda

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 3.4 inches

##### Nesda, cool

Surface layer texture: Very gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Occasional

Available water capacity: 3.0 inches

#### Nishon Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Poorly drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landform:* Closed depressions

*Parent material:* Alluvium

*Slope range:* 0 to 1 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Typic Albaqualfs

### Typical Pedon

Nishon clay loam, 0 to 1 percent slope, in a cropland area, 1,000 feet south and 1,700 feet east of the northwest corner of sec. 3, T. 36 N., R. 4 W.

**Ap**—0 to 4 inches; gray (10YR 6/1) clay loam, very dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and many fine vesicular pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

**Bt1**—4 to 14 inches; gray (10YR 5/1) clay, very dark gray (10YR 4/1) moist; many medium prominent brown (7.5YR 5/4) mottles; moderate medium and fine subangular blocky structure; very hard, very firm, sticky and plastic; common very fine roots and few very fine tubular pores; common distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

**Bt2**—14 to 22 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; common very fine roots and few very fine tubular pores; common distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

**Bk1**—22 to 33 inches; light gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; moderate medium and fine angular blocky structure; very hard, very firm, sticky and plastic; few very fine roots and tubular pores; many medium soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

**Bk2**—33 to 60 inches; light gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; massive; very hard, very firm, sticky and plastic; few very fine roots and tubular pores; strongly effervescent; many medium soft masses of lime; moderately alkaline.

### Range in Characteristics

*Control section:* 4 to 22 inches

*Content of clay in the control section:* 40 to 60 percent

*Depth to seasonal high water table:* 12 to 36 inches

*Depth to Bk horizon:* 16 to 34 inches

### Ap horizon

Hue: 2.5Y or 10YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1 or 2

Mottles: Few to common (10YR 5/3, 4/3)

Clay content: 27 to 35 percent

Reaction: pH 6.1 to 8.4

### Bt horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 0, 1, or 2

Mottles: Few to common (10YR 5/3, 4/3, or 2.5Y 5/2, 5/3)

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Reaction: pH 6.6 to 9.0

### Bk horizons

Hue: 2.5Y or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 0, 1, 2, or 3

Mottles: Few to common (10YR 4/4, 6/4 moist)

Texture: Clay loam, clay, or silty clay

Clay content: 35 to 55 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

**Note:** Some pedons have a C horizon.

## 28A—Nishon clay loam, 0 to 1 percent slopes

### Setting

Landform: Closed depressions

Slope: 0 to 1 percent

### Composition

#### Major Components

Nishon and similar soils: 95 percent

#### Minor Components

Soils that are artificially drained: 0 to 3 percent

McKenzie, saline: 0 to 1 percent

Nishon clay: 0 to 1 percent

### Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Ponding: Long  
Available water capacity: 9.3 inches

## Nobe Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Moderately well drained  
*Permeability:* Very slow (less than 0.06 inch/hour)  
*Landforms:* Alluvial fans or stream terraces  
*Parent material:* Alluvium  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic  
(calcareous), frigid Oxyaquic Ustorthents

### Typical Pedon

Nobe clay loam in an area of Absher-Nobe complex, 0 to 2 percent slopes; in a rangeland area, 1,400 feet south and 1,600 feet east of the northwest corner of sec. 8, T. 37 N., R. 1 W.

E—0 to 1 inch; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure parting to moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; neutral; abrupt smooth boundary.

Bn—1 to 3 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium columnar structure parting to strong medium angular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and pores; common distinct clay films on faces of peds and lining pores; neutral; gradual wavy boundary.

Bknyz—3 to 17 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; soft, friable, sticky and plastic; many very fine and common fine roots, many very fine and fine pores; few fine soft masses of lime; few fine crystals of gypsum and other salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bnz1—17 to 34 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine filaments of soluble salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bnz2—34 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; few fine filaments of

soluble salts; violently effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 60 percent

*Depth to the Bkyz horizon:* 4 to 6 inches

#### E horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Loam (when mixed to 7 inches it is clay loam or clay)

Clay content: 20 to 50 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 0 to 13

Reaction: pH 6.6 to 8.4

#### Bn horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 27 to 50 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 0 to 30

Reaction: pH 6.6 to 8.4

**Note:** This horizon in some areas is recognized as having characteristics of an argillic or cambic horizon but does not meet the minimum requirements of thickness for either one.

#### Bknyz and Bnz1 horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Gypsum: 1 to 6 percent

Sodium absorption ratio: 13 to 40 percent

Reaction: pH 7.9 to 9.6

#### Bnz2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam that is stratified with loam, clay loam, or silt loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Gypsum: 1 to 6

Sodium absorption ratio: 13 to 70

Reaction: pH 7.9 to 9.6

**64B—Nobe clay, 0 to 4 percent slopes****Setting**

Landform: Stream terraces  
Slope: 0 to 4 percent

**Composition****Major Components**

Nobe and similar soils: 85 percent

**Minor Components**

Ferd and similar soils: 0 to 5 percent  
Gerdrum and similar soils: 0 to 5 percent  
Evanston and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Clay  
Depth class: Very deep (more than 60 inches)  
Drainage class: Moderately well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Salt affected: Saline within 30 inches  
Sodium affected: Sodic within 30 inches  
Available water capacity: 4.2 inches

**Nunemaker Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Very slow (less than 0.06 inch/hour)  
*Landform:* Till plains  
*Parent material:* Glaciofluvial deposits over glacial till  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Aridic Ustochrepts

**Typical Pedon**

Nunemaker silty clay loam, 0 to 4 percent slopes, in a rangeland area, 50 feet north and 2,200 feet east of the southwest corner of sec. 10, T. 32 N., R. 1 W.

A—0 to 4 inches; gray (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots and few fine discontinuous pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—4 to 12 inches; gray (10YR 6/2) silty clay, very dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine and few fine roots, few very fine and fine pores; slightly effervescent; mildly alkaline; gradual wavy boundary.

Bk—12 to 21 inches; gray (10YR 6/2) clay, brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots and few fine roots and pores; few fine soft masses of lime; slightly effervescent; mildly alkaline; gradual wavy boundary.

Bky—21 to 60 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and plastic; few very fine roots; common soft masses of lime; few fine nests of gypsum; strongly effervescent; moderately alkaline.

**Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 55 percent

*Depth to Bk horizon:* 10 to 16 inches

**A horizon**

Hue: 10YR or 2.5Y  
Value: 4 or 5 dry; 3 or 4 moist  
Chroma: 2 or 3  
Clay content: 35 to 40 percent  
Rock fragments: 0 to 5 percent pebbles  
Reaction: pH 7.4 to 8.4

**Bw horizon**

Hue: 10YR or 2.5Y  
Value: 4, 5, or 6 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Silty clay loam, clay, or silty clay  
Clay content: 45 to 55 percent  
Rock fragments: 0 to 5 percent pebbles  
Reaction: pH 7.4 to 8.4

**Note:** The Bw horizon is formed in glaciofluvial material, while the Bk horizon is either glaciofluvial material or glacial till.

**Bk horizon**

Hue: 10YR or 2.5Y  
Value: 4, 5, or 6 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Clay loam, silty clay loam, clay, or silty clay  
Clay content: 35 to 50 percent  
Rock fragments: 0 to 10 percent pebbles  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.9 to 8.4

*Bky horizons*

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Clay or clay loam (below 40 inches textures include sandy clay loam and loam)  
 Clay content: 35 to 45 percent  
 Rock fragments: 0 to 20 percent pebbles  
 Calcium carbonate equivalent: 5 to 10 percent  
 Gypsum: 1 to 5 percent  
 Reaction: pH 7.9 to 9.0

**29B—Nunemaker silty clay loam, 0 to 4 percent slopes***Setting*

Landform: Till plains  
 Slope: 0 to 4 percent

*Composition***Major Components**

Nunemaker and similar soils: 85 percent

**Minor Components**

Marvan and similar soils: 0 to 7 percent  
 McKenzie and similar soils: 0 to 2 percent  
 Vanda and similar soils: 0 to 6 percent

*Major Component Description*

Surface layer texture: Silty clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Glaciofluvial deposits  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.2 inches

**29C—Nunemaker silty clay loam, 4 to 8 percent slopes***Setting*

Landform: Till plains  
 Slope: 4 to 8 percent

*Composition***Major Components**

Nunemaker and similar soils: 85 percent

**Minor Components**

Vanda and similar soils: 0 to 4 percent

McKenzie and similar soils: 0 to 2 percent

Marvan and similar soils: 0 to 3 percent

Soils that have slopes more than 8 percent: 0 to 3 percent

Soils that have slopes less than 4 percent: 0 to 3 percent

*Major Component Description*

Surface layer texture: Silty clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Glaciofluvial deposits  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.2 inches

**Perma Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Mountains  
*Parent material:* Colluvium  
*Slope range:* 2 to 70 percent  
*Annual precipitation:* 18 to 22 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 70 to 105 days

**Taxonomic Class:** Loamy-skeletal, mixed Typic Haploborolls

**Typical Pedon**

Perma cobbly loam in an area of Perma-Whitlash cobbly loams, 25 to 70 percent slopes; in a rangeland area, 500 feet north and 1,300 feet east of the southwest corner of sec. 17, T. 36 N., R. 3 E.

A—0 to 10 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 15 percent pebbles and 10 percent cobbles; neutral; clear smooth boundary.

Bw1—10 to 20 inches; yellowish brown (10YR 5/4) very cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots pores; 30 percent pebbles and 20 percent cobbles; neutral; clear smooth boundary.

Bw2—20 to 30 inches; yellowish brown (10YR 5/4) very cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure;

slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 35 percent pebbles and 20 percent cobbles; neutral; clear smooth boundary.

C—30 to 60 inches; pale brown (10YR 6/3) extremely cobbly loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots, few very fine and fine pores; 50 percent pebbles and 25 percent cobbles; neutral.

#### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 10 to 15 inches

*Content of clay in the control section:* 7 to 20 percent

#### *A horizon*

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 7 to 20 percent

Rock fragments: 15 to 35 percent—0 to 30 percent cobbles, stones, boulders, 10 to 35 percent pebbles

Reaction: pH 6.6 to 7.3

#### *Bw horizons*

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or sandy loam

Clay content: 7 to 20 percent

Rock fragments: 35 to 85 percent—0 to 50 percent cobbles and stones, 25 to 65 percent pebbles

Reaction: pH 6.6 to 7.8

#### *BC horizon*

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam, loamy sand, or sandy loam

Clay content: 0 to 15 percent

Rock fragments: 60 to 85 percent—10 to 50 percent cobbles and stones, 50 to 65 percent pebbles

Reaction: pH 6.6 to 7.8

### **88C—Perma gravelly loam, 2 to 8 percent slopes**

#### ***Setting***

Landform: Mountains

Slope: 2 to 8 percent

#### ***Composition***

##### **Major Components**

Perma and similar soils: 85 percent

##### **Minor Components**

Soils that have slopes more than 8 percent: 0 to 5 percent

Whitlash and similar soils: 0 to 4 percent

Shambo and similar soils: 0 to 3 percent

Farnuf and similar soils: 0 to 3 percent

#### ***Major Component Description***

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.1 inches

### **88E—Perma gravelly loam, 8 to 25 percent slopes**

#### ***Setting***

Landform: Mountains

Slope: 8 to 25 percent

#### ***Composition***

##### **Major Components**

Perma and similar soils: 85 percent

##### **Minor Components**

Soils that have slopes more than 25 percent: 0 to 5 percent

Whitlash and similar soils: 0 to 4 percent

Shambo and similar soils: 0 to 3 percent

Farnuf and similar soils: 0 to 3 percent

#### ***Major Component Description***

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.1 inches

**881E—Perma-Whitlash cobbly loams, 8 to 25 percent slopes*****Setting***

Landforms: Perma—mountains; Whitlash—mountains  
 Position on landform: Perma—back slopes;  
 Whitlash—shoulders  
 Slope: Perma—8 to 25 percent; Whitlash—8 to 25 percent

***Composition*****Major Components**

Perma and similar soils: 45 percent  
 Whitlash and similar soils: 40 percent

**Minor Components**

Farnuf and similar soils: 0 to 5 percent  
 Soils that have slopes less than 8 percent: 0 to 5 percent  
 Rock outcrop: 0 to 5 percent

***Major Component Description*****Perma**

Surface layer texture: Cobbly loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Somewhat excessively drained  
 Dominant parent material: Colluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 4.1 inches

**Whitlash**

Surface layer texture: Cobbly loam  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Colluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 1.9 inches

**881F—Perma-Whitlash cobbly loams, 25 to 70 percent slopes*****Setting***

Landforms: Perma—mountains; Whitlash—mountains  
 Position on landform: Perma—back slopes;  
 Whitlash—shoulders (fig. 5)  
 Slope: Perma—25 to 70 percent; Whitlash—25 to 70 percent

***Composition*****Major Components**

Perma and similar soils: 45 percent  
 Whitlash and similar soils: 40 percent

**Minor Components**

Farnuf and similar soils: 0 to 5 percent  
 Soils that have slopes less than 25 percent:  
 0 to 5 percent  
 Rock outcrop: 0 to 5 percent

***Major Component Description*****Perma**

Surface layer texture: Cobbly loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Somewhat excessively drained  
 Dominant parent material: Colluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 4.1 inches

**Whitlash**

Surface layer texture: Cobbly loam  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Colluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 1.9 inches

**Phillips Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Till plains  
*Parent material:* Glacial till  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Typic Eutroboralfs

**Typical Pedon**

Phillips clay loam, 0 to 4 percent slopes, in a rangeland area, 1,000 feet north and 1,000 feet east of the southwest corner of sec. 9, T. 34 N., R. 2 W.  
 E—0 to 3 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate very fine



granular structure; soft, friable, slightly sticky and slightly plastic; many very fine roots and pores and many fine roots; many very fine pores; neutral; clear smooth boundary.

E/B—3 to 7 inches; about 60 percent pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist (E part); about 40 percent brown (10YR 5/3) clay loam, brown (10YR 4/3) moist (B part); moderate medium prismatic structure parting to strong thin and medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores and common fine pores; neutral; abrupt smooth boundary.

Bt—7 to 16 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine and common fine roots and common very fine pores;

many distinct clay films on faces of peds; neutral; gradual wavy boundary.

Btk—16 to 20 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and pores; common faint clay films on faces of peds; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk1—20 to 28 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and few very fine pores; common fine and medium soft masses and seams of lime; violently effervescent; moderately alkaline; gradual wavy boundary.



Figure 5. Typical area of Perma-Whitlash cobbly loams, 25 to 70 percent slopes, in the Sweetgrass Hills. Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes is in the forested background.

**Bk2**—28 to 42 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine pores; many fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**C**—42 to 60 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

#### **Range in Characteristics**

*Control section:* 7 to 20 inches

*Content of clay in the control section:* 35 to 45 percent

*Depth to Bk horizon:* 12 to 20 inches

#### *E and E/B horizons*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

#### *Bt horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 8.4

#### *Btk and Bk horizons*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 25 to 40 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### *C horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 4 to 8 mmhos/cm

Gypsum: 1 to 3 percent

Air dry bulk density: More than 1.6 g/cc

Reaction: pH 7.4 to 8.4

### **33B—Phillips clay loam, 0 to 4 percent slopes**

#### ***Setting***

Landform: Till plains

Slope: 0 to 4 percent

#### ***Composition***

#### **Major Components**

Phillips and similar soils: 85 percent

#### **Minor Components**

Elloam and similar soils: 0 to 7 percent

Nishon and similar soils: 0 to 2 percent

Absher and similar soils: 0 to 6 percent

#### ***Major Component Description***

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.4 inches

### **331B—Phillips-Elloam clay loams, 0 to 4 percent slopes**

#### ***Setting***

Landforms: Phillips—till plains; Elloam—till plains

Position on landform: Phillips—microhighs; Elloam—microlows

Slope: Phillips—0 to 4 percent; Elloam—0 to 4 percent

#### ***Composition***

#### **Major Components**

Phillips and similar soils: 50 percent

Elloam and similar soils: 35 percent

#### **Minor Components**

Slickspots: 0 to 5 percent

Nishon and similar soils: 0 to 2 percent

Elloam clay: 0 to 5 percent  
 Acel and similar soils: 0 to 3 percent

### ***Major Component Description***

#### **Phillips**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.4 inches

#### **Elloam**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 6.6 inches

### **332B—Phillips-Kevin clay loams, 0 to 4 percent slopes**

#### ***Setting***

Landforms: Phillips—till plains; Kevin—till plains  
 Slope: Phillips—0 to 4 percent; Kevin—0 to 4 percent

#### ***Composition***

#### **Major Components**

Phillips and similar soils: 50 percent  
 Kevin and similar soils: 35 percent

### ***Major Component Description***

#### **Phillips**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.4 inches

#### **Kevin**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

#### **Reeder Series**

*Depth class:* Moderately deep (20 to 40 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)

*Landform:* Sedimentary plains

*Parent material:* Residuum weathered from semiconsolidated interbedded sandstone and shale

*Slope range:* 0 to 8 percent

*Annual precipitation:* 15 to 19 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed Typic Argiborolls

#### **Typical Pedon**

Reeder clay loam in an area of Reeder-Cabba complex, 0 to 4 percent slopes; in a cropland area, 2,000 feet east and 1,300 feet north of the southwest corner of sec. 5, T. 36 N., R. 4 W.

Ap—0 to 6 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, friable, slightly sticky and slightly plastic; common very fine roots and discontinuous pores; neutral; abrupt smooth boundary.

Bt—6 to 13 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure; hard, friable, slightly sticky and plastic; common very fine roots and discontinuous pores; few faint clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bk—13 to 20 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to weak moderate angular blocky structure; hard, friable, sticky and plastic; few very fine roots and pores; common fine shaped soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—20 to 32 inches; white (2.5Y 8/2) clay loam, light brownish gray (2.5Y 6/2) moist; strong thin platy structure; hard, friable, sticky and plastic; few very fine and fine roots and pores; disseminated lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

Cr—32 to 60 inches; light gray (10YR 7/2) semiconsolidated interbedded sandstone and

shale, grayish brown (10YR 5/2) moist; slightly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 6 to 13 inches

*Mollic epipedon thickness:* 7 to 16 inches

*Content of clay in the control section:* 18 to 35 percent

*Depth to semiconsolidated bedrock:* 20 to 40 inches

*Depth to Bk horizon:* 11 to 26 inches

#### Ap horizon

Hue: 10YR or 2.5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 33 percent

Reaction: pH 6.1 to 7.3

#### Bt horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Loam, sandy clay loam, or clay loam

Clay content: Between 20 and 30 percent clay; ranges from 18 to 35 percent and from 20 to 45 percent fine sand and coarser

Reaction: pH 6.6 to 8.4

#### Bk and BC horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, silty clay loam, clay loam, or sandy clay loam

Clay content: 15 to 30 percent

Reaction: pH 7.4 to 8.4

Calcium carbonate equivalent: 6 to 20 percent

#### Cr horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Texture: Loam, clay loam, or silty clay

Reaction: pH 7.4 to 8.4

### 411B—Reeder-Cabba complex, 0 to 4 percent slopes

#### Setting

Landforms: Reeder—sedimentary plains; Cabba—sedimentary plains

Position on landform: Cabba—shoulders

Slope: Reeder—0 to 4 percent; Cabba—0 to 4 percent

### Composition

#### Major Components

Reeder and similar soils: 60 percent

Cabba and similar soils: 25 percent

#### Minor Components

Macar and similar soils: 0 to 5 percent

Farnuf and similar soils: 0 to 5 percent

Rock outcrop: 0 to 5 percent

### Major Component Description

#### Reeder

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.0 inches

#### Cabba

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.3 inches

### 411C—Reeder-Cabba complex, 4 to 8 percent slopes

#### Setting

Landforms: Reeder—sedimentary plains; Cabba—sedimentary plains

Position on landform: Reeder—foot slopes; Cabba—shoulders

Slope: Reeder—4 to 8 percent; Cabba—4 to 8 percent

### Composition

#### Major Components

Reeder and similar soils: 55 percent

Cabba and similar soils: 30 percent

#### Minor Components

Soils that have slopes more than 8 percent: 0 to 5 percent

Rock outcrop: 0 to 4 percent  
 Macar and similar soils: 0 to 3 percent  
 Farnuf and similar soils: 0 to 3 percent

### ***Major Component Description***

#### **Reeder**

Surface layer texture: Clay loam  
 Depth class: Moderately deep (20 to 40 inches)  
 Drainage class: Well drained  
 Dominant parent material: Interbedded sandstone  
 and shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 5.0 inches

#### **Cabba**

Surface layer texture: Fine sandy loam  
 Depth class: Shallow (10 to 20 inches)  
 Drainage class: Well drained  
 Dominant parent material: Interbedded sandstone  
 and shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 2.3 inches

## **2A—Riverwash**

### ***Composition***

#### **Major Components**

Riverwash: 85 percent

#### **Minor Components**

Nesda and similar soils: 0 to 5 percent  
 Rivra and similar soils: 0 to 5 percent  
 Ryell and similar soils: 0 to 5 percent

### ***Major Component Description***

*Definition:* Unstabilized areas of sandy, silty, clayey,  
 or gravelly sediments  
 Flooding: Frequent

#### **Rivra Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Rapid (6.0 to 20.0 inches/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Sandy-skeletal, mixed, frigid Aridic  
 Ustifluvents

### **Typical Pedon**

Rivra sandy loam in an area of Ryell-Rivra complex,  
 0 to 2 percent slopes; in a rangeland area, 1,300  
 feet south and 10 feet east of the northwest corner  
 of sec. 36, T. 31 N., R. 2 W.

- A—0 to 5 inches; light gray (10YR 7/2) sandy loam,  
 brown (10YR 5/3) moist; weak fine granular  
 structure; soft, very friable, slightly sticky and  
 slightly plastic; few very fine roots and  
 discontinuous pores and few fine roots; strongly  
 effervescent; mildly alkaline; clear wavy boundary.
- C1—5 to 18 inches; light brownish gray (10YR 6/2)  
 gravelly loamy coarse sand, brown (10YR 5/3)  
 moist; single grain; loose, nonsticky and  
 nonplastic; many very fine and medium roots;  
 25 percent pebbles; strongly effervescent;  
 moderately alkaline; gradual wavy boundary.
- C2—18 to 60 inches; light brownish gray (10YR 6/2)  
 extremely gravelly sand, brown (10YR 4/3) moist;  
 single grain; loose, nonsticky and nonplastic; few  
 fine roots; 60 percent pebbles and 15 percent  
 cobbles; strongly effervescent; moderately  
 alkaline.

### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 0 to 5 percent

*Rock fragments in the control section:* 55 to 80  
 percent

#### **A horizon**

Hue: 10YR or 2.5Y  
 Value: 5, 6, or 7 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Clay content: 5 to 15 percent  
 Reaction: pH 6.6 to 8.4

#### **C horizons**

Hue: 10YR or 2.5Y  
 Value: 5, 6, or 7 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Sand or loamy coarse sand that consists  
 of stratification of these and some finer sands  
 Clay content: 0 to 5 percent  
 Rock fragments: 55 to 80 percent—10 to 20  
 percent stones and cobbles, 45 to 70 percent  
 pebbles

Reaction: pH 7.4 to 8.4

**Note:** Thin buried A horizons do occur above 40 inches.

## Roy Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderately slow (0.2 to 0.6 inch/hour)

*Landform:* Hills

*Parent material:* Colluvium

*Slope range:* 25 to 65 percent

*Annual precipitation:* 15 to 19 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 70 to 105 days

**Taxonomic Class:** Clayey-skeletal, mixed Typic Argiborolls

### Typical Pedon

Roy gravelly clay loam, 25 to 60 percent slopes, in a rangeland area, 500 feet south and 400 feet west of the northeast corner of sec. 20. T. 37 N., R. 3 E.

A—0 to 6 inches; very dark grayish brown (10YR 4/2) gravelly clay loam, very dark brown (10YR 2/2) moist; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 20 percent pebbles; neutral; abrupt smooth boundary.

Bt1—6 to 10 inches; brown (10YR 4/3) very gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and pores; 35 percent pebbles and 10 percent cobbles; neutral; clear smooth boundary.

Bt2—10 to 25 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and common very fine and fine pores; 35 percent pebbles and 15 percent cobbles; neutral; gradual wavy boundary.

Bk—25 to 60 inches; brown (10YR 5/3) extremely gravelly clay loam, brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; 45 percent pebbles and 20 percent cobbles; mildly alkaline.

### Range in Characteristics

*Control section:* 6 to 25 inches

*Mollic epipedon thickness:* 10 to 14 inches

*Content of clay in the control section:* 35 to 50 percent

*Depth to Bk horizon:* Greater than 20 inches

### A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Rock fragments: 15 to 35 percent—5 to 10 percent stones and cobbles, 10 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

### Bt horizons

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Clay loam or clay

Clay content: 35 to 50 percent

Rock fragments: 35 to 80 percent—20 to 50 percent stones and cobbles, 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

### Bk horizon

Hue: 7.5YR through 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3, 4, or 5

Texture: Clay loam or sandy clay loam

Clay content: 27 to 40 percent

Rock fragments: 35 to 80 percent—20 to 50 percent stones and cobbles, 15 to 30 percent pebbles

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 7.4 to 8.4

## 71F—Roy gravelly clay loam, 25 to 60 percent slopes

### Setting

Landform: Hills

Slope: 25 to 60 percent

### Composition

#### Major Components

Roy and similar soils: 85 percent

#### Minor Components

Soils that have slopes less than 25 percent: 0 to 10 percent

Farnuf and similar soils: 0 to 5 percent

### **Major Component Description**

Surface layer texture: Gravelly clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Colluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 4.3 inches

### **300F—Rubble land**

#### **Composition**

##### **Major Components**

Rubble land: 85 percent

##### **Minor Components**

Soils with areas of scant vegetation: 0 to 15 percent

#### **Major Component Description**

*Definition:* Areas with more than 90 percent of the surface covered by stones and boulders, supporting little or no vegetation

### **Ryell Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour) to 26 inches; rapid below this depth (6.0 to 20.0 inches/hour)  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Aridic Ustifluvents

#### **Typical Pedon**

Ryell loam in an area of Ryell-Havre loams, 0 to 2 percent slopes; in a rangeland area, 2,000 feet south and 200 feet west of the northeast corner of sec. 4, T. 28 N., R. 3 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; soft, very friable, slightly

sticky and nonplastic; many fine and few medium roots and common fine pores; slightly effervescent; mildly alkaline; clear wavy boundary.

C1—5 to 16 inches; grayish brown (10YR 5/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky structure; hard, very friable, slightly sticky and nonplastic; many fine roots and pores and few medium roots; strongly effervescent; mildly alkaline; clear wavy boundary.

C2—16 to 26 inches; grayish brown (10YR 5/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots and pores; strongly effervescent; moderately alkaline; clear wavy boundary.

2C3—26 to 60 inches; brown (10YR 5/3) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; single grain, loose, nonsticky and nonplastic; few fine and very fine roots on the upper part; 50 percent pebbles and 5 percent cobbles; coarse lime and lime crusts on the undersides of coarse fragments; strongly effervescent; moderately alkaline.

#### **Range in Characteristics**

*Control section:* 10 to 40 inches  
*Content of clay in the control section:* 10 to 18 percent in the coarse-loamy horizons, 0 to 10 percent in the 2C horizon  
*Rock fragments in the control section:* 35 to 70 percent  
*Depth to 2C horizon:* 18 to 36 inches

##### **A horizon**

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Clay content: 15 to 27 percent  
 Reaction: pH 7.4 to 8.4

##### **C1 and C2 horizons**

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Very fine sandy loam, loamy very fine sand, or loam consisting of very fine sandy loam with thin strata of silt loam and/or fine sandy loam  
 Clay content: 10 to 18 percent

Rock fragments: 0 to 5 percent pebbles  
Reaction: pH 7.4 to 8.4

**2C3 horizon**

Hue: 10YR, 2.5Y, or 5Y  
Value: 5 or 6 dry; 4 or 5 moist  
Chroma: 2 or 3  
Texture: Sand or loamy sand  
Clay content: 0 to 10 percent  
Rock fragments: 35 to 70 percent—0 to 15 percent cobbles, 35 to 55 percent pebbles  
Reaction: pH 7.4 to 8.4

**572A—Ryell-Havre loams, 0 to 2 percent slopes**

***Setting***

Landforms: Ryell—flood plains; Havre—flood plains  
Slope: Ryell—0 to 2 percent; Havre—0 to 2 percent

***Composition***

**Major Components**

Ryell and similar soils: 45 percent  
Havre and similar soils: 40 percent

**Minor Components**

Bigsag and similar soils: 0 to 3 percent  
Bigsandy and similar soils: 0 to 2 percent  
Soils that are rarely flooded: 0 to 4 percent  
Soils that are frequently flooded: 0 to 3 percent  
Soils with areas of cottonwood trees: 0 to 3 percent

***Major Component Description***

**Ryell**

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: Occasional  
Available water capacity: 5.3 inches

**Havre**

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: Occasional  
Available water capacity: 9.7 inches

**571A—Ryell-Rivra complex, 0 to 2 percent slopes**

***Setting***

Landforms: Ryell—flood plains; Rivra—flood plains  
Slope: Ryell—0 to 2 percent; Rivra—0 to 2 percent

***Composition***

**Major Components**

Ryell and similar soils: 50 percent  
Rivra and similar soils: 35 percent

**Minor Components**

Havre and similar soils: 0 to 5 percent  
Bigsag and similar soils: 0 to 3 percent  
Bigsandy and similar soils: 0 to 2 percent  
Soils that are frequently flooded: 0 to 5 percent

***Major Component Description***

**Ryell**

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: Occasional  
Available water capacity: 5.3 inches

**Rivra**

Surface layer texture: Gravelly sandy loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: Occasional  
Available water capacity: 1.9 inches

**Sagedale Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Alluvial fans  
*Parent material:* Alluvium  
*Slope range:* 2 to 8 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine, montmorillonitic, frigid Typic Ustochrepts



### Typical Pedon

Sagedale silty clay loam, 2 to 8 percent slopes, in a cropland area, 1,500 feet south and 1,600 feet east of the northwest corner of sec. 5, T. 35 N., R. 4 W.

**Ap**—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; hard, firm, sticky and plastic; common very fine roots and pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

**Bw**—5 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; hard, firm, sticky and plastic; few very fine roots and pores; slightly effervescent; moderately alkaline; clear smooth boundary.

**Bk**—12 to 35 inches; light gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few very fine roots and pores and few fine pores; few fine threads of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

**C**—35 to 60 inches; light gray (2.5Y 7/2) silty clay loam, light yellowish brown (2.5Y 6/2) moist; massive; hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 45 percent

*Depth to Bk horizon:* 10 to 15 inches

#### *Ap horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 2, 3, or 4

Clay content: 30 to 40 percent

Reaction: pH 7.4 to 8.4

#### *Bw horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay loam

Clay content: 32 to 45 percent

Reaction: pH 7.4 to 8.4

#### *Bk horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

#### *BC horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 1 or 2

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Gypsum: 1 to 6 percent

Reaction: pH 7.4 to 9.0

**Note:** Some pedons have a By or Bky horizon.

## 323C—Sagedale silty clay loam, 2 to 8 percent slopes

### Setting

Landform: Alluvial fans

Slope: 2 to 8 percent

### Composition

#### Major Components

Sagedale and similar soils: 85 percent

#### Minor Components

Daglum and similar soils: 0 to 8 percent

Soils that have slopes more than 8 percent:

0 to 7 percent

### Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.5 inches

### Savage Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landforms:* Alluvial fans, stream terraces, or small drainageways

*Parent material:* Alluvium

*Slope range:* 0 to 3 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine, montmorillonitic Typic Argiborolls

### Typical Pedon

Savage silty clay loam, 0 to 3 percent slopes, in a cropland area, 200 feet north and 100 feet east of the southwest corner of sec. 29, T. 37 N., R. 3 W.

**Ap**—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium granular structure; hard, friable, sticky and plastic; many very fine and fine roots and pores; neutral; abrupt smooth boundary.

**Bt1**—5 to 9 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; many very fine and fine roots and tubular pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

**Bt2**—9 to 16 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; common very fine and fine roots and pores; common distinct clay films on faces of peds and lining pores; mildly alkaline; clear wavy boundary.

**Bk1**—16 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic structure; very hard, firm, sticky and plastic; common very fine roots and tubular pores and common fine roots; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**Bk2**—23 to 42 inches; light yellowish brown (5Y 6/4) silty clay, olive (5Y 4/3) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots and pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**BC**—42 to 60 inches; light yellowish brown (5Y 6/3) silty clay loam, olive (5Y 4/3) moist; massive; very hard, firm, sticky and plastic; few very fine roots and pores; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 5 to 17 inches

*Mollic epipedon thickness:* 8 to 16 inches

*Content of clay in the control section:* 27 to 45 percent

*Depth to Bk horizon:* 10 to 22 inches

#### Ap horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 45 percent

Reaction: pH 6.1 to 7.8

#### Bt horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 3, 4, or 5 dry; 2, 3, or 4 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Reaction: pH 6.1 to 8.4

**Note:** A Btk horizon 4 to 18 inches thick is allowed.

#### Bk and BC horizons

Hue: 7.5YR through 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 30 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

**Note:** Some pedons have C and By horizons below a depth of 36 inches.

### 82B—Savage silty clay loam, 0 to 3 percent slopes

#### Setting

Landforms: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 3 percent

#### Composition

#### Major Components

Savage and similar soils: 85 percent

#### Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.0 inches

### Scobey Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landforms:* Till plains or hills

*Parent material:* Glacial till

*Slope range:* 0 to 15 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Aridic Argiborolls

### Typical Pedon

Scobey clay loam in an area of Scobey-Kevin clay loams, 0 to 4 percent slopes; in a cropland area, 1,700 feet north and 100 feet west of the southeast corner of sec. 14, T. 31 N., R. 1 E.

**Ap**—0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate medium granular structure parting to weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

**Bt**—6 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and many very fine and common fine pores; many distinct clay films on faces of peds; mildly alkaline; gradual wavy boundary.

**Btk**—12 to 18 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and pores; few faint clay films on faces of peds; few fine segregated soft masses and seams of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**Bk**—18 to 30 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots and pores and few fine pores; few fine soft masses and seams of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

**C**—30 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark brownish gray (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots and pores; violently effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 6 to 18 inches

*Mollic epipedon thickness:* 7 to 14 inches

*Content of clay in the control section:* 35 to 45 percent

*Depth to Bk horizon:* 12 to 25 inches

*Ap horizon*

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 6.1 to 7.8

### *Bt horizon*

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles

Reaction: pH 6.6 to 8.4

### *Btk and Bk horizons*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 30 to 40 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

### *C horizon*

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 30 to 40 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles

Calcium carbonate equivalent: 5 to 12 percent

Gypsum: 1 to 6 percent

Reaction: pH 7.4 to 8.4

**Note:** By or BC horizons are allowed below a depth of 40 inches.

## 563B—Scobey clay loam, 0 to 4 percent slopes

### Setting

Landform: Till plains

Slope: 0 to 4 percent

### Composition

#### Major Components

Scobey, calcareous and similar soils: 85 percent

#### Minor Components

Soils that have noncalcareous surface layers: 0 to 5 percent

Elloam and similar soils: 0 to 4 percent

Absher and similar soils: 0 to 3 percent  
Acel and similar soils: 0 to 3 percent

### ***Major Component Description***

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

### **561B—Scobey-Kevin clay loams, 0 to 4 percent slopes**

#### ***Setting***

Landforms: Scobey—till plains; Kevin—till plains  
Slope: Scobey—0 to 4 percent; Kevin—0 to 4 percent

#### ***Composition***

#### **Major Components**

Scobey and similar soils: 50 percent  
Kevin and similar soils: 40 percent

#### **Minor Components**

Kevin clay loam calcareous: 0 to 2 percent  
Nishon and similar soils: 0 to 2 percent  
Elloam and similar soils: 0 to 2 percent  
Absher and similar soils: 0 to 2 percent  
Acel and similar soils: 0 to 2 percent

### ***Major Component Description***

#### **Scobey**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

#### **Kevin**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

### **561C—Scobey-Kevin clay loams, 4 to 8 percent slopes**

#### ***Setting***

Landforms: Scobey—till plains; Kevin—till plains  
Position on landform: Scobey—foot slopes; Kevin—shoulders  
Slope: Scobey—4 to 8 percent; Kevin—4 to 8 percent

#### ***Composition***

#### **Major Components**

Scobey and similar soils: 50 percent  
Kevin and similar soils: 40 percent

#### **Minor Components**

Kevin clay loam calcareous: 0 to 4 percent  
Nishon and similar soils: 0 to 2 percent  
Elloam and similar soils: 0 to 2 percent  
Absher and similar soils: 0 to 2 percent

### ***Major Component Description***

#### **Scobey**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

#### **Kevin**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

### **561D—Scobey-Kevin clay loams, 8 to 15 percent slopes**

#### ***Setting***

Landforms: Scobey—hills; Kevin—hills  
Position on landform: Scobey—back slopes; Kevin—shoulders  
Slope: Scobey—8 to 15 percent; Kevin—8 to 15 percent

### **Composition**

#### **Major Components**

Scobey and similar soils: 45 percent

Kevin and similar soils: 40 percent

#### **Minor Components**

Kevin clay loam calcareous: 0 to 4 percent

Nishon and similar soils: 0 to 1 percent

Soils that have slopes less than 8 percent: 0 to 4 percent

Elloam and similar soils: 0 to 3 percent

Absher and similar soils: 0 to 3 percent

### **Major Component Description**

#### **Scobey**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

#### **Kevin**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

#### **Shambo Series**

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Moderate (0.6 to 2.0 inches/hour)

*Landform:* Alluvial fans

*Parent material:* Alluvium

*Slope range:* 0 to 4 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed Typic Haploborolls

#### **Typical Pedon**

Shambo loam, 0 to 4 percent slopes, in a cropland area, 100 feet south and 100 feet east of the northwest corner of sec. 6, T. 37 N, R. 4 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2)

loam, dark brown (10YR 3/3) moist; weak

fine granular structure; soft, very friable,

nonsticky and nonplastic; many very fine roots

and pores; neutral; abrupt smooth boundary.

Bw1—6 to 10 inches; brown (10YR 5/3) loam,

dark brown (10YR 3/3) moist; weak medium

subangular blocky structure; slightly hard, friable,

nonsticky and nonplastic; many very fine roots

and pores; mildly alkaline; clear smooth boundary.

Bw2—10 to 15 inches; brown (10YR 5/3) loam, dark

brown (10YR 4/3) moist; weak medium

subangular blocky structure; hard, friable, slightly

sticky and slightly plastic; many very fine roots

and common fine pores; mildly alkaline; clear

smooth boundary.

Bk1—15 to 26 inches; light gray (2.5Y 7/2) loam,

brown (10YR 5/3) moist; moderate medium

subangular blocky structure; hard, friable, slightly

sticky and slightly plastic; common very fine roots

and pores; common fine soft masses of lime;

violently effervescent; moderately alkaline;

gradual smooth boundary.

Bk2—26 to 60 inches; light brownish gray (2.5Y 6/2)

loam, brown (10YR 5/3) moist; weak fine

subangular blocky structure; slightly hard, friable,

slightly sticky and slightly plastic; common very

fine roots and pores; common fine filaments and

soft masses of lime; violently effervescent;

moderately alkaline.

### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Mollic epipedon thickness:* 7 to 16 inches

*Content of clay in the control section:* 18 to 30 percent

*Depth to Bk horizon:* 14 to 20 inches

#### **Ap horizon**

Hue: 10YR

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Reaction: pH 6.6 to 7.3

#### **Bw horizons**

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, or clay loam; typically averages 15 to 45 percent fine sand and coarser

Clay content: 18 to 30 percent

Reaction: pH 6.6 to 8.4

*Bk horizons*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, silty clay loam, or silt loam

Clay content: 18 to 30 percent

Calcium carbonate equivalent: 5 to 20 percent

Reaction: pH 7.4 to 8.4

**Note:** Some pedons have a C or B<sub>ck</sub> horizon.**74B—Shambo loam, 0 to 4 percent slopes*****Setting***

Landform: Alluvial fans

Slope: 0 to 4 percent

***Composition*****Major Components**

Shambo and similar soils: 85 percent

**Minor Components**

Shambo loam, calcareous: 0 to 8 percent

Daglum and similar soils: 0 to 7 percent

***Major Component Description***

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.2 inches

**743A—Shambo-Fairway loams, 0 to 2 percent slopes*****Setting***

Landforms: Shambo—alluvial fans; Fairway—flood plains

Slope: Shambo—0 to 2 percent; Fairway—0 to 2 percent

***Composition*****Major Components**

Shambo and similar soils: 60 percent

Fairway and similar soils: 30 percent

**Minor Components**

Soils that have slopes more than 2 percent: 0 to 5 percent

Nesda and similar soils: 0 to 5 percent

***Major Component Description*****Shambo**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.2 inches

**Fairway**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: 8.1 inches

**Stemple Series***Depth class:* Very deep (greater than 60 inches)*Drainage class:* Well drained*Permeability:* Moderate (0.6 to 2.0 inches/hour)*Landform:* Mountains*Parent material:* Colluvium*Slope range:* 25 to 70 percent*Annual precipitation:* 18 to 22 inches*Annual air temperature:* 38 to 42 degrees F*Frost-free period:* 50 to 70 days**Taxonomic Class:** Loamy-skeletal, mixed Typic Paleoboralfs**Typical Pedon**

Stemple very cobbly loam in an area of Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes; in a woodland area, 1,700 feet 1,200 feet of the southwest corner of sec. 23, T. 37 N., R. 1 E.

O—2 to 0 inches; forest litter of partially decomposed needles, twigs, roots, and forbs; abrupt smooth boundary.

A—0 to 2 inches; dark gray (10YR 4/1) very cobbly loam, black (10YR 2/1) moist; weak fine

subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; 15 percent pebbles and 10 percent cobbles; medium acid; clear smooth boundary.

E1—2 to 8 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure parting to moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots, many very fine pores; 25 percent pebbles and 20 percent cobbles; strongly acid; clear smooth boundary.

E2—8 to 25 inches; very pale brown (10YR 7/3) extremely cobbly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure parting to moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine pores; 35 percent pebbles and 20 percent cobbles; medium acid; gradual wavy boundary.

E/Bt—25 to 32 inches; about 60 percent pale brown (10YR 7/3) extremely cobbly loam, brown (10YR 5/3) moist (E part); about 40 percent brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist (Bt part); moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and few medium roots, many very fine pores; common faint clay films on ped faces in Bt part; 35 percent pebbles and 25 percent cobbles; medium acid; gradual wavy boundary.

Bt1—32 to 37 inches; light yellowish brown (10YR 6/4) extremely cobbly clay loam, yellowish brown (10YR 4/4) moist; very moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and many very fine pores; few faint clay films on ped faces; 45 percent pebbles and 25 percent cobbles; slightly acid; gradual wavy boundary.

Bt2—37 to 60 inches; light yellowish brown (10YR 6/4) extremely cobbly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots and many very fine pores; common distinct clay films on ped faces; 40 percent pebbles and 30 percent cobbles; slightly acid.

#### Range in Characteristics

*Control section:* 25 to 40 inches

*Content of clay in the control section:* 27 to 35 percent

*Depth to the Bt horizon:* 25 to 50 inches

#### A and E horizons

Hue: 7.5YR through 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Rock fragments: 35 to 60 percent—10 to 20 percent flagstones or cobbles, 25 to 40 percent channers or pebbles

Reaction: pH 5.1 to 6.5

#### E/Bt horizon

Hue: 7.5YR through 2.5Y

Value: E part—6, 7, or 8 dry and 4, 5, or 6 moist;

B part—5 or 6 dry and 4 or 5 moist

Chroma: E part—2, 3, or 4; B part—4, 5, or 6

Clay content: 15 to 27 percent

Rock fragments: 35 to 80 percent—0 to 10 percent flagstones or cobbles, 35 to 70 percent channers or pebbles

Reaction: pH 5.1 to 6.5

#### Bt horizons

Hue: 7.5YR through 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 4, 5, or 6

Clay content: 27 to 35 percent

Rock fragments: 60 to 80 percent—10 to 20 percent flagstones or cobbles, 50 to 60 percent channers or pebbles

Reaction: pH 5.6 to 6.5

### 861F—Stemple, high elevation-Rubble land complex, 25 to 70 percent slopes

#### Setting

Landform: Mountains

Position on landform: Back slopes

Slope: 25 to 70 percent

#### Composition

##### Major Components

Stemple and similar soils: 50 percent

Rubble land: 40 percent

##### Minor Components

Soils that have slopes less than 25 percent: 0 to 5 percent

Soils that have no coarse fragments: 0 to 5 percent

#### Major Component Description

##### Stemple

Surface layer texture: Very cobbly loam

Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Colluvium  
 Native plant cover type: Forest land  
 Flooding: None  
 Available water capacity: 3.6 inches

#### **Rubble land**

*Definition:* Areas with more than 90 percent of the surface covered by stones and boulders, supporting little or no vegetation

### **862F—Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes**

#### **Setting**

Landform: Mountains  
 Position on landform: Back slopes  
 Slope: 25 to 70 percent

#### **Composition**

#### **Major Components**

Stemple and similar soils: 50 percent  
 Rubble land: 40 percent

#### **Minor Components**

Soils that have slopes less than 25 percent: 0 to 5 percent  
 Soils that have no coarse fragments: 0 to 5 percent

#### **Major Component Description**

#### **Stemple**

Surface layer texture: Very cobbly loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Colluvium  
 Native plant cover type: Forest land  
 Flooding: None  
 Available water capacity: 3.6 inches

#### **Rubble land**

*Definition:* Areas with more than 90 percent of the surface covered by stones and boulders, supporting little or no vegetation

### **Sunburst Series**

Depth class: Very deep (greater than 60 inches)  
 Drainage class: Well drained  
 Permeability: Slow (0.06 to 0.2 inch/hour)

*Landforms:* Hills or escarpments

*Parent material:* Glacial till

*Slope range:* 8 to 70 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

#### **Typical Pedon**

Sunburst clay loam, 8 to 15 percent slopes, in a cropland area, 2,000 feet north and 50 feet east of the southwest corner of sec. 9, T. 29 N., R. 2 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, firm, sticky and plastic; many very fine roots and common fine and very fine discontinuous pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bk—6 to 20 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; many very fine roots and common fine and very fine pores; common fine rounded soft masses of lime; strongly effervescent; mildly alkaline; gradual wavy boundary.

Bky1—20 to 28 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and few very fine pores; many fine rounded soft masses of lime in seams and faces of peds; common fine soft masses of gypsum; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky2—28 to 60 inches; gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; massive; hard, firm, sticky and plastic; common very fine roots and few very fine pores; many fine rounded soft masses of lime in seams and faces of peds; common fine soft masses of gypsum; violently effervescent; moderately alkaline.

#### **Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 50 percent

#### **Ap horizon**

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3



Clay content: 27 to 40 percent  
Reaction: pH 7.4 to 8.4

*Bk horizon*

Hue: 2.5Y or 5Y  
Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Texture: Clay, clay loam, or silty clay loam  
Clay content: 35 to 50 percent  
Rock fragments: 0 to 15 percent—0 to 5 percent  
cobbles, 0 to 10 percent pebbles  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.9 to 8.4

*Bky horizons*

Hue: 2.5Y or 5Y  
Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
Chroma: 2 or 3  
Texture: Clay, clay loam, or silty clay  
Clay content: 35 to 50 percent  
Rock fragments: 0 to 15 percent—0 to 5 percent  
cobbles, 0 to 10 percent pebbles  
Calcium carbonate equivalent: 5 to 15 percent  
Gypsum: 1 to 3 percent  
Reaction: pH 7.9 to 9.0

**53D—Sunburst clay loam, 8 to 15 percent slopes**

***Setting***

Landform: Hills  
Slope: 8 to 15 percent

***Composition***

**Major Components**

Sunburst and similar soils: 85 percent

**Minor Components**

Soils that have noncalcareous surface layers: 0 to 5 percent  
Hillon and similar soils: 0 to 5 percent  
Kevin and similar soils: 0 to 5 percent

***Major Component Description***

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 8.3 inches

**53E—Sunburst clay loam, 15 to 25 percent slopes**

***Setting***

Landform: Hills  
Slope: 15 to 25 percent

***Composition***

**Major Components**

Sunburst and similar soils: 85 percent

**Minor Components**

Soils that have noncalcareous surface layers: 0 to 5 percent  
Hillon and similar soils: 0 to 5 percent  
Kevin and similar soils: 0 to 5 percent

***Major Component Description***

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 8.3 inches

**53F—Sunburst clay loam, 25 to 70 percent slopes**

***Setting***

Landform: Hills  
Slope: 25 to 70 percent

***Composition***

**Major Components**

Sunburst and similar soils: 85 percent

**Minor Components**

Hillon and similar soils: 0 to 5 percent  
Kevin and similar soils: 0 to 5 percent  
Soils that have noncalcareous surface layers: 0 to 5 percent

***Major Component Description***

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till

Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.3 inches

## Tally Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid (2.0 to 6.0 inches/hour)  
*Landforms:* Alluvial fans or hills  
*Parent material:* Alluvium or eolian deposits  
*Slope range:* 2 to 15 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Coarse-loamy, mixed Typic  
 Haploborolls

### Typical Pedon

Tally sandy loam, 2 to 8 percent slopes, in a rangeland area, 60 feet north and 90 feet east of the center of sec. 13, T. 37 N., R. 6 W.

**A**—0 to 4 inch; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; neutral; abrupt smooth boundary.

**Bw**—4 to 14 inches; dark brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium angular blocky structure; hard, friable, nonsticky and nonplastic; common fine roots; mildly alkaline; gradual wavy boundary.

**Bk1**—14 to 23 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure; hard, very friable, nonsticky and nonplastic; common fine roots; few soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

**Bk2**—23 to 42 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common fine soft masses of lime and coating sands and pebbles; strongly effervescent; moderately alkaline; diffuse irregular boundary.

**2Bk3**—42 to 60 inches; light brownish gray (10YR 6/2) loamy fine sand, dark brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; few fine roots; strongly effervescent; moderately alkaline.

## Range in Characteristics

*Control section:* 10 to 40 inches  
*Mollic epipedon thickness:* 10 to 16 inches  
*Content of clay in the control section:* 5 to 18 percent  
*Depth to Bk horizon:* 15 to 30 inches

### A horizon

Hue: 2.5Y, 10YR, or 7.5YR  
 Value: 3, 4, or 5 dry; 2, 3, or 4 moist  
 Chroma: 2 or 3  
 Clay content: 5 to 15 percent  
 Reaction: pH 6.1 to 7.8.

### Bw horizon

Hue: 7.5YR, 10YR, or 2.5Y  
 Value: 4 or 5 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Texture: Fine sandy loam or sandy loam  
 Clay content: 5 to 18 percent  
 Rock fragments: 0 to 15 percent pebbles  
 Reaction: pH 6.6 to 8.4

### Bk horizons

Hue: 10YR, 2.5Y, or 7.5YR  
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Loamy fine sand, loamy sand, fine sand, fine sandy loam, or sandy loam  
 Clay content: 5 to 18 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 8.4

**Note:** The loamy fine sand, loamy sand, and fine sand occur at a depth of more than 20 inches; some pedons have glacial till at depths of 40 to 60 inches.

## 12C—Tally sandy loam, 2 to 8 percent slopes

### Setting

Landform: Alluvial fans  
 Slope: 2 to 8 percent

### Composition

#### Major Components

Tally and similar soils: 85 percent

#### Minor Components

Blanchard and similar soils: 0 to 8 percent  
 Soils that have slopes more than 8 percent: 0 to 7 percent

### **Major Component Description**

Surface layer texture: Sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium or eolian material  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 7.0 inches

### **12D—Tally sandy loam, 8 to 15 percent slopes**

#### **Setting**

Landform: Hills  
 Slope: 8 to 15 percent

#### **Composition**

##### **Major Components**

Tally and similar soils: 85 percent

##### **Minor Components**

Blanchard and similar soils: 0 to 8 percent  
 Soils that have slopes less than 8 percent: 0 to 7 percent

### **Major Component Description**

Surface layer texture: Sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium or eolian material  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 7.0 inches

### **Tanna Series**

*Depth class:* Moderately deep (20 to 40 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Till plains  
*Parent material:* Glacial till deposited over shale  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic Aridic Argiborolls

#### **Typical Pedon**

Tanna clay loam, 0 to 4 percent slopes, in a cropland

area, 1,300 feet south and 2,200 feet west of the northeast corner of sec. 19, T. 34 N., R. 1 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots and many very fine and fine pores; 5 percent channers; mildly alkaline; abrupt smooth boundary.

Bt—6 to 15 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong fine and medium prismatic structure parting to strong fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and many very fine and fine pores; many distinct clay films on faces of peds; 2 percent channers; mildly alkaline; clear smooth boundary.

Bk1—15 to 20 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium prismatic structure parting to moderate medium angular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots and common fine roots and pores; common medium filaments and threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—20 to 28 inches; gray (10YR 5/3) clay loam, dark gray (10YR 4/3) moist; weak subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots and very fine pores; few fine soft masses of lime; 20 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—28 to 60 inches; gray (10YR 5/1) consolidated shale, dark gray (10YR 4/1) moist; neutral.

#### **Range in Characteristics**

*Control section:* 6 to 15 inches

*Mollic epipedon thickness:* 7 to 12 inches

*Content of clay in the control section:* 35 to 45 percent

*Depth to semiconsolidated bedrock:* 20 to 40 inches

*Depth to Bk horizon:* 11 to 18 inches

#### **Ap horizon**

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 7.8

#### **Bt horizon**

Hue: 10YR or 2.5Y

Value: 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Clay loam, silty clay loam, clay, or silty clay  
 Clay content: 35 to 50 percent  
 Reaction: pH 6.6 to 8.4

**Bk1 horizon**

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 2 or 3  
 Texture: Clay loam, silty clay loam, or clay  
 Clay content: 35 to 50 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 8.4

**Bk2 horizon**

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 4 or 5 moist  
 Chroma: 1, 2, 3, or 4  
 Texture: Loam, clay loam, clay, or silty clay loam  
 Clay content: 15 to 40 percent  
 Rock fragments: 0 to 60 percent—0 to 5 percent cobbles, 10 to 55 percent channers  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 9.0  
**Note:** Some pedons have a Bky horizon with few to common threads of gypsum.

**Cr horizon**

Material: Semiconsolidated shale with thin layers of hard sandstone that are rippable

### 13B—Tanna clay loam, 0 to 4 percent slopes

#### **Setting**

Landform: Till plains  
 Slope: 0 to 4 percent

#### **Composition**

##### **Major Components**

Tanna and similar soils: 85 percent

##### **Minor Components**

Neldore and similar soils: 0 to 8 percent  
 Tanna clay loam calcareous: 0 to 7 percent

#### **Major Component Description**

Surface layer texture: Clay loam  
 Depth class: Moderately deep (20 to 40 inches)  
 Drainage class: Well drained

Dominant parent material: Shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 3.8 inches

### 13C—Tanna clay loam, 4 to 8 percent slopes

#### **Setting**

Landform: Till plains  
 Slope: 4 to 8 percent

#### **Composition**

##### **Major Components**

Tanna and similar soils: 85 percent

##### **Minor Components**

Neldore and similar soils: 0 to 8 percent  
 Tanna clay loam calcareous: 0 to 7 percent

#### **Major Component Description**

Surface layer texture: Clay loam  
 Depth class: Moderately deep (20 to 40 inches)  
 Drainage class: Well drained  
 Dominant parent material: Shale residuum  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 3.8 inches

### **Telstad Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landform:* Till plains  
*Parent material:* Glacial till  
*Slope range:* 0 to 8 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed Aridic Argiborolls

#### **Typical Pedon**

Telstad loam in an area of Telstad-Joplin loams, 0 to 4 percent slopes; in a cropland area, 1,075 feet north and 2,600 feet west of the southeast corner of sec. 35, T. 33 N., R. 1 W.

Ap—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular

structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine roots and many very fine pores; neutral; abrupt smooth boundary.

**Bt1**—5 to 10 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; slightly hard, firm, sticky and plastic; few medium and fine roots and common very fine pores; few faint clay films on faces of peds; neutral; clear wavy boundary.

**Bt2**—10 to 19 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate coarse and medium subangular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots and common very fine pores; common distinct clay films on faces of peds; slightly effervescent; mildly alkaline; clear wavy boundary.

**Bk**—19 to 37 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine roots and few very fine pores; few fine filaments and irregularly shaped soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

**By**—37 to 60 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; few fine irregularly shaped nests of gypsum; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 5 to 19 inches

*Mollic epipedon thickness:* 7 to 12 inches

*Content of clay in the control section:* 25 to 35 percent

*Depth to Bk horizon:* 10 to 20 inches

#### *A horizon*

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 32 percent

Reaction: pH 6.6 to 7.8

#### *Bt horizons*

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Reaction: pH 6.6 to 8.4

#### *Bk horizon*

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

#### *By horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Gypsum: 0 to 3 percent

Air dry bulk density: 1.7 or more

Reaction: pH 7.9 to 8.4

## 50B—Telstad clay loam, 0 to 4 percent slopes

### Setting

Landform: Till plains

Slope: 0 to 4 percent

### Composition

#### Major Components

Telstad and similar soils: 85 percent

#### Minor Components

Elloam and similar soils: 0 to 5 percent

Joplin and similar soils: 0 to 5 percent

Acel and similar soils: 0 to 5 percent

### Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

**503B—Telstad-Joplin clay loams, 0 to 4 percent slopes*****Setting***

Landforms: Telstad—till plains; Joplin—till plains  
Slope: Telstad—0 to 4 percent; Joplin—0 to 4 percent

***Composition*****Major Components**

Telstad and similar soils: 50 percent  
Joplin and similar soils: 40 percent

**Minor Components**

Elloam and similar soils: 0 to 3 percent  
McKenzie and similar soils: 0 to 2 percent  
Hillon and similar soils: 0 to 3 percent  
Acel and similar soils: 0 to 2 percent

***Major Component Description*****Telstad**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

**Joplin**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.1 inches

**503C—Telstad-Joplin clay loams, 4 to 8 percent slopes*****Setting***

Landforms: Telstad—till plains; Joplin—till plains  
Position on landform: Telstad—foot slopes; Joplin—shoulders  
Slope: Telstad—4 to 8 percent; Joplin—4 to 8 percent

***Composition*****Major Components**

Telstad and similar soils: 45 percent  
Joplin and similar soils: 40 percent

**Minor Components**

Elloam and similar soils: 0 to 7 percent  
McKenzie and similar soils: 0 to 2 percent  
Hillon and similar soils: 0 to 6 percent

***Major Component Description*****Telstad**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.8 inches

**Joplin**

Surface layer texture: Clay loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.1 inches

**504B—Telstad-Joplin loams, 0 to 4 percent slopes*****Setting***

Landforms: Telstad—till plains; Joplin—till plains  
Slope: Telstad—0 to 4 percent; Joplin—0 to 4 percent

***Composition*****Major Components (fig. 6)**

Telstad and similar soils: 50 percent  
Joplin and similar soils: 35 percent

**Minor Components**

Elloam and similar soils: 0 to 5 percent  
McKenzie and similar soils: 0 to 2 percent  
Hillon and similar soils: 0 to 5 percent  
Acel and similar soils: 0 to 3 percent

***Major Component Description*****Telstad**

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland



Figure 6. Typical area of stripcropping on Telstad-Joplin loams, 0 to 4 percent slopes.

Flooding: None  
Available water capacity: 9.9 inches

#### **Joplin**

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.2 inches

#### **504C—Telstad-Joplin loams, 4 to 8 percent slopes**

##### ***Setting***

Landforms: Telstad—till plains; Joplin—till plains  
Position on landform: Telstad—foot slopes; Joplin—shoulders

Slope: Telstad—4 to 8 percent; Joplin—4 to 8 percent

##### ***Composition***

##### **Major Components**

Telstad and similar soils: 45 percent  
Joplin and similar soils: 40 percent

##### **Minor Components**

Hillon and similar soils: 0 to 13 percent  
McKenzie and similar soils: 0 to 2 percent

##### ***Major Component Description***

##### **Telstad**

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Till  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 9.9 inches

**Joplin**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.2 inches

**Tinsley Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Excessively drained  
*Permeability:* Rapid (6.0 to 20.0 inches/hour)  
*Landforms:* Outwash plains, kames, or eskers  
*Parent material:* Glacial outwash  
*Slope range:* 2 to 25 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Sandy-skeletal, mixed, frigid Typic  
 Ustorthents

**Typical Pedon**

Tinsley gravelly sandy loam, 8 to 25 percent slopes, in a cropland area, 2,600 feet west and 2,000 feet north of the southeast corner of sec. 23, T. 37 N., R. 2 W.

Ap—0 to 4 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots and common very fine pores; 20 percent pebbles; moderately alkaline; abrupt smooth boundary.

C—4 to 60 inches; brown (10YR 5/3) very gravelly coarse sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; 40 percent pebbles; violently effervescent; strongly alkaline.

**Range in Characteristics**

*Control section:* 10 to 40 inches  
*Content of clay in the control section:* 0 to 10 percent  
*Rock fragments in the control section:* 35 to 70 percent

**Ap horizon**

Hue: 10YR or 2.5Y  
 Value: 4 or 5 dry; 3 or 4 moist  
 Chroma: 2, 3, or 4  
 Clay content: 5 to 10 percent  
 Rock fragments: 15 to 60 percent—0 to 10

percent stones and cobbles, 15 to 50  
 percent pebbles  
 Reaction: pH 6.6 to 7.8

**C horizon**

Hue: 10YR or 2.5Y  
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Sand or loamy sand  
 Clay content: 0 to 10 percent  
 Rock fragments: 35 to 70 percent—5 to 25 percent stones and cobbles, 30 to 45 percent pebbles  
 Reaction: pH 6.6 to 8.4.

**77C—Tinsley gravelly sandy loam, 2 to 8 percent slopes****Setting**

Landform: Outwash plains  
 Slope: 2 to 8 percent

**Composition****Major Components**

Tinsley and similar soils: 85 percent

**Minor Components**

Yetull and similar soils: 0 to 5 percent  
 Attewan and similar soils: 0 to 5 percent  
 Evanston and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Gravelly sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Excessively drained  
 Dominant parent material: Glacial outwash  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 1.2 inches

**77E—Tinsley gravelly sandy loam, 8 to 25 percent slopes****Setting**

Landforms: Kames and eskers  
 Slope: 8 to 25 percent

**Composition****Major Components**

Tinsley and similar soils: 85 percent



### Minor Components

Busby and similar soils: 0 to 5 percent

Yamac and similar soils: 0 to 5 percent

Soils that have slopes less than 8 percent: 0 to 5 percent

### Major Component Description

Surface layer texture: Gravelly sandy loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Excessively drained  
 Dominant parent material: Glacial outwash  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 1.2 inches

### Trudau Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderately slow (0.2 to 0.6 inch/hour)  
*Landform:* Alluvial fans  
*Parent material:* Alluvium  
*Slope range:* 0 to 4 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed, frigid Aridic Ustochrepts

### Typical Pedon

Trudau loam, 0 to 4 percent slopes, in a cropland area, 750 feet north and 1,400 feet west of the southeast corner of sec. 6, T. 34 N., R. 3 W.

Ap—0 to 4 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots and common fine pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bw—4 to 12 inches; dark grayish brown (2.5Y 6/2) clay loam, very dark grayish brown (2.5Y 5/2) moist; moderate subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots and pores and few fine roots; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkz1—12 to 25 inches; light grayish brown (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak

coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots and pores; very few fine filaments of lime; very few fine filaments of salt crystals; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkz2—25 to 40 inches; light grayish brown (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and plastic; few very fine roots and pores; few fine filaments of lime; very few fine filaments of salt crystals; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkz3—40 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; few very fine roots and pores; common few lime on faces of peds; very few fine filaments of salt crystals; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 20 to 35 percent

*Depth to the Bkz horizon:* 10 to 23 inches

#### Ap horizon

Hue: 10YR or 2.5Y  
 Value: 5, 6, or 7 dry; 3, 4, or 5 moist  
 Chroma: 2 or 3  
 Clay content: 20 to 27 percent  
 Reaction: pH 8.4 to 9.0

#### Bw horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Loam or clay loam  
 Clay content: 20 to 35 percent  
 Rock fragments: 0 to 5 percent pebbles  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Sodium absorption ratio: less than 5  
 Reaction: pH 8.4 to 9.0

#### Bkz horizons

Hue: 10YR or 2.5Y  
 Value: 6, 7, or 8 dry; 5, 6, or 7 moist  
 Chroma: 2, 3, or 4  
 Texture: Mainly loam stratified with sandy loam, silt loam, or clay loam  
 Clay content: 18 to 27 percent  
 Calcium carbonate equivalent: 5 to 15 percent  
 Electrical conductivity: 8 to 16 mmhos/cm  
 Sodium absorption ratio: 2 to 13  
 Reaction: pH 8.4 to 9.0

**54B—Trudau loam, 0 to 4 percent slopes****Setting**

Landform: Alluvial fans  
Slope: 0 to 4 percent

**Composition****Major Components**

Trudau and similar soils: 85 percent

**Minor Components**

Yamac and similar soils: 0 to 5 percent  
Marvan and similar soils: 0 to 5 percent  
Vanda and similar soils: 0 to 5 percent

**Major Component Description**

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Salt affected: Saline within 30 inches  
Available water capacity: 6.0 inches

**Turner Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour) to 21 inches; rapid below this depth (6.0 to 20.0 inches/hour)  
*Landform:* Relict stream terraces  
*Parent material:* Alluvium  
*Slope range:* 0 to 6 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls

**Typical Pedon**

Turner loam, 0 to 4 percent slopes, in a cropland area, 50 feet south and 3,200 feet east of the northwest corner of sec. 5, T. 35 N., R. 4 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic;

many very fine and fine roots and common fine pores; 5 percent pebbles; neutral; abrupt smooth boundary.

Bt—5 to 10 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common faint clay films on faces of peds and lining tubular pores; 5 percent pebbles; neutral; gradual wavy boundary.

Btk—10 to 15 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; few faint clay films on faces of peds and lining tubular pores; 5 percent pebbles; few fine soft masses of lime; strongly effervescent; mildly alkaline; gradual wavy boundary.

Bk—15 to 21 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; 10 percent pebbles; many medium soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2C—21 to 60 inches; grayish brown (2.5Y 5/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; 40 percent pebbles and 10 percent cobbles; strongly effervescent; moderately alkaline.

**Range in Characteristics**

*Control section:* 5 to 40 inches  
*Mollic epipedon thickness:* 7 to 15 inches  
*Depth to Bk horizon:* 11 to 20 inches  
*Depth to 2C horizon:* 20 to 40 inches

**Ap horizon**

Hue: 10YR or 7.5YR  
Value: 2 or 3 moist  
Chroma: 2 or 3  
Texture: Loam or sandy loam  
Clay content: 15 to 25 percent  
Reaction: pH 6.1 to 7.8

**Bt and Btk horizons**

Hue: 7.5YR, 10YR, or 2.5Y  
Value: 4, 5, or 6 dry; 3, 4, or 5 moist  
Chroma: 2 or 3  
Texture: Clay loam, sandy clay loam, or loam  
Clay content: 25 to 35 percent

Rock fragments: 0 to 30 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles  
Reaction: pH 6.6 to 8.4

**Bk horizon**

Hue: 7.5YR, 10YR, or 2.5Y  
Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist  
Chroma: 2 or 3  
Texture: Loam or clay loam  
Clay content: 25 to 35 percent  
Rock fragments: 0 to 30 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles  
Calcium carbonate equivalent: 5 to 15 percent  
Reaction: pH 7.4 to 8.4

**2C horizon**

Hue: 2.5Y or 10YR  
Chroma: 2, 3, or 4  
Texture: Loamy sand or sand  
Clay content: 0 to 5 percent  
Rock fragments: 35 to 80 percent—5 to 20 percent cobbles, 30 to 60 percent pebbles  
Reaction: pH 7.4 to 8.4

**51B—Turner loam, 0 to 4 percent slopes**

**Setting**

Landform: Relict stream terraces  
Slope: 0 to 4 percent

**Composition**

**Major Components**

Turner and similar soils: 85 percent

**Minor Components**

Turner loam calcareous: 0 to 5 percent  
Farnuf and similar soils: 0 to 5 percent  
Soils that have slopes more than 4 percent: 0 to 5 percent

**Major Component Description**

Surface layer texture: Loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 4.6 inches

**511C—Turner sandy loam, 2 to 6 percent slopes**

**Setting**

Landform: Relict stream terraces  
Slope: 2 to 6 percent

**Composition**

**Major Components**

Turner and similar soils: 85 percent

**Minor Components**

Tinsley and similar soils: 0 to 8 percent  
Farnuf and similar soils: 0 to 7 percent

**Major Component Description**

Surface layer texture: Sandy loam  
Depth class: Very deep (more than 60 inches)  
Drainage class: Well drained  
Dominant parent material: Alluvium  
Native plant cover type: Rangeland  
Flooding: None  
Available water capacity: 4.4 inches

**Vaeda Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Very slow (less than 0.06 inch/hour)  
*Landform:* Alluvial fans  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic, nonacid, frigid Aridic Ustorthents

**Typical Pedon**

Vaeda silty clay loam, 0 to 2 percent slopes, in a rangeland area, 2,600 feet south and 600 feet west of the northeast corner of sec. 17, T. 32 N., R. 2 W.

E—0 to 2 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; very hard, friable, slightly sticky and slightly plastic; many very fine roots and common very fine pores; medium acid; abrupt smooth boundary.

Bnz—2 to 13 inches; gray (10YR 6/2) silty clay, very dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots and common fine roots and pores; many fine soft masses of salt crystals; medium acid; clear smooth boundary.

Bnyz1—13 to 28 inches; gray (10YR 6/1) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots and pores; common fine soft masses and seams of gypsum and other salts; slightly acid; clear smooth boundary.

Bnyz2—28 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, dark gray (10YR 4/1) moist; massive; hard, firm, sticky and plastic; few very fine roots and few fine roots and pores; few fine soft masses and seams of gypsum and other salts; slightly acid.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 60 percent

*Depth to the Bnyz horizon:* 10 to 15 inches

#### E horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 35 to 40 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 5.6 to 7.8

**Note:** Some pedons may have an A horizon that is 1/2- to 1-inch thick.

#### Bnz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 60 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 20

Reaction: pH 5.1 to 7.8

**Note:** Some pedons have a Bw horizon 3 to 6 inches thick.

#### Bnyz horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 60 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 20

Gypsum: 1 to 5 percent

Reaction: pH 6.1 to 8.4

### 62A—Vaeda silty clay loam, 0 to 2 percent slopes

#### Setting

Landform: Alluvial fans

Slope: 0 to 2 percent

#### Composition

##### Major Components

Vaeda and similar soils: 90 percent

##### Minor Components

Creed and similar soils: 0 to 5 percent

Marias and similar soils: 0 to 5 percent

#### Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.4 inches

#### Vanda Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Very slow (less than 0.06 inch/hour)

*Landform:* Alluvial fans

*Parent material:* Alluvium

*Slope range:* 0 to 8 percent

*Annual precipitation:* 10 to 14 inches

*Annual air temperature:* 42 to 45 degrees F

*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

### Typical Pedon

Vanda silty clay, 0 to 4 percent slopes, in a rangeland area, 700 feet north and 1,300 feet west of the southeast corner of sec. 22, T. 34 N., R. 2 W.

**E**—0 to 1 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate very thin platy structure; soft, very friable, sticky and plastic; common very fine and fine roots and many very fine and fine pores; moderately alkaline; abrupt smooth boundary.

**Bk**—1 to 9 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine prismatic structure parting to moderate medium blocky structure; hard, firm, very sticky and plastic; many very fine and fine roots and pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

**Bknyz**—9 to 18 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine angular blocky structure; very hard, very firm, very sticky and plastic; few very fine roots and common very fine pores; common fine irregularly shaped soft masses of lime; common fine soft masses and seams of gypsum and other salts; slightly effervescent; moderately alkaline; gradual smooth boundary.

**Bnyz1**—18 to 52 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky and plastic; few very fine roots and common very fine pores; common medium irregularly shaped soft masses of gypsum and other salts; slightly effervescent; moderately alkaline; gradual wavy boundary.

**Bnyz2**—52 to 60 inches; dark grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky and plastic; few very fine roots and pores; many medium and coarse irregularly shaped soft masses of gypsum and other salts; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 35 to 60 percent

*Depth to the Bknyz horizon:* 7 to 24 inches

#### *E horizon*

Hue: 2.5Y or 5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Hardness: Very hard, extremely hard, or massive crusts

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 1 to 30

Reaction: pH 7.8 to 9.6

**Note:** In some pedons the upper 6 inches of soil is noncalcareous unless mixed.

#### *Bk horizon*

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Hardness: Very hard or extremely hard

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 30

Reaction: pH 7.8 to 9.6

#### *Bknyz and Bnyz horizons*

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Hardness: Very hard or extremely hard

Gypsum: 1 to 5 percent with total gypsum less than 150

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 30

Gypsum: 1 to 5 percent

Reaction: pH 7.8 to 9.6

## 48B—Vanda silty clay, 0 to 4 percent slopes

### *Setting*

Landform: Alluvial fans

Slope: 0 to 4 percent

### *Composition*

#### **Major Components**

Vanda and similar soils: 85 percent

#### **Minor Components**

Benz and similar soils: 0 to 5 percent

Marvan and similar soils: 0 to 5 percent

Creed and similar soils: 0 to 3 percent

Gerdrum and similar soils: 0 to 2 percent

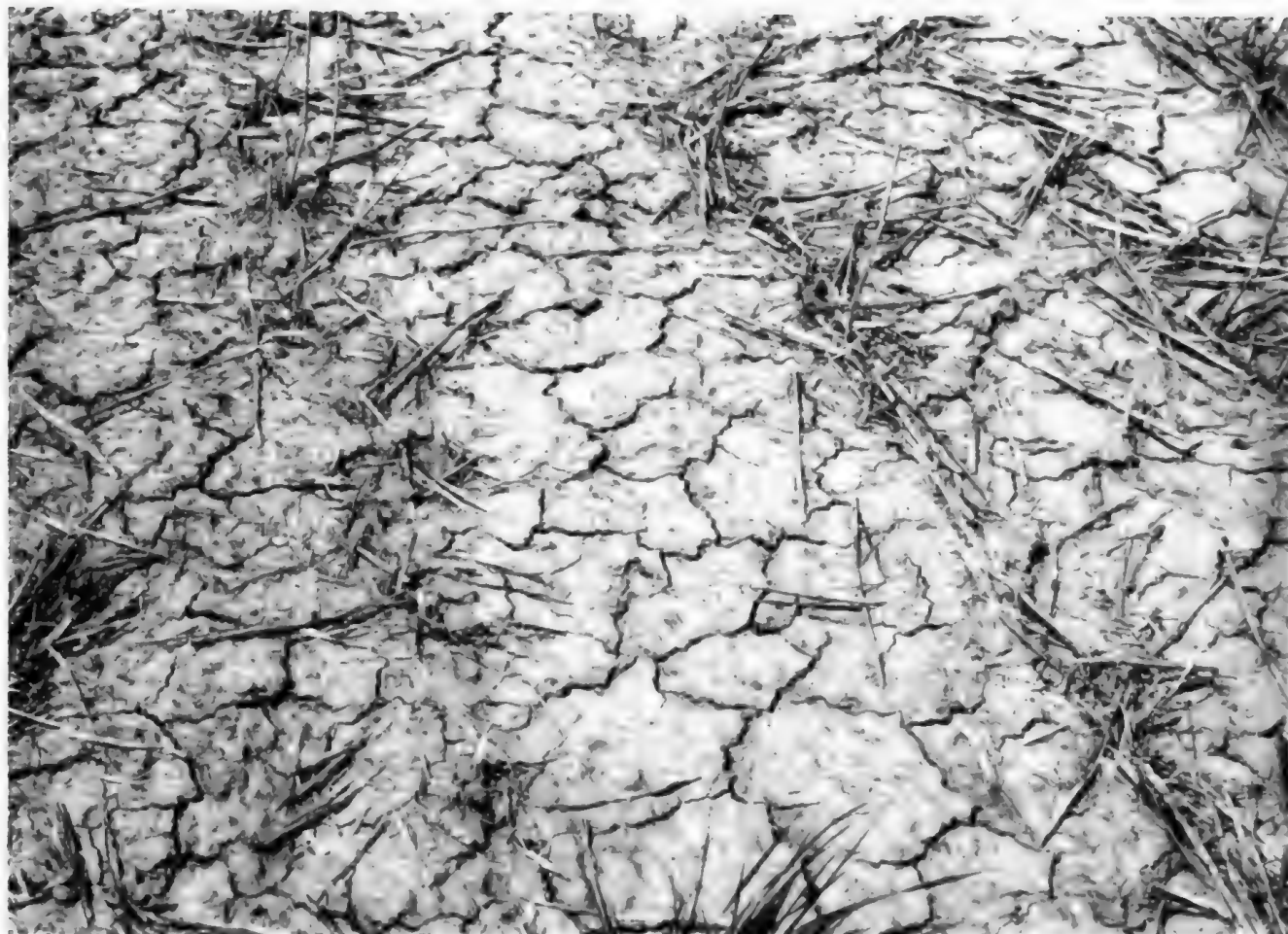


Figure 7. Cracks and surface crusting on a typical area of Vanda silty clay, 0 to 4 percent slopes.

### ***Major Component Description***

Surface layer texture: Silty clay (fig. 7)  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 6.0 inches

### **48C—Vanda silty clay, 4 to 8 percent slopes**

#### ***Setting***

Landform: Alluvial fans  
 Slope: 4 to 8 percent

### ***Composition***

#### **Major Components**

Vanda and similar soils: 85 percent

#### **Minor Components**

Benz and similar soils: 0 to 5 percent  
 Marvan and similar soils: 0 to 5 percent  
 Creed and similar soils: 0 to 3 percent  
 Gerdrum and similar soils: 0 to 2 percent

### ***Major Component Description***

Surface layer texture: Silty clay  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 6.0 inches

**482A—Vanda-Marvan, saline, clays, 0 to 2 percent slopes*****Setting***

Landforms: Vanda—alluvial fans; Marvan—alluvial fans (fig. 8)

Slope: Vanda—0 to 2 percent; Marvan—0 to 2 percent

***Composition*****Major Components**

Vanda and similar soils: 50 percent

Marvan and similar soils: 35 percent

**Minor Components**

Marias and similar soils: 0 to 5 percent

Soils that have slopes more than 2 percent: 0 to 5 percent

Marvan, nonsaline: 0 to 5 percent

***Major Component Description*****Vanda**

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.0 inches

**Marvan**

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None



Figure 8. Typical area of Vanda-Marvan, saline clays, 0 to 2 percent slopes. The Vanda soil occupies the less vegetated microlow positions and the Marvan, saline soil occupies the better vegetated microhighs.



Salt affected: Saline within 30 inches  
 Sodium affected: Sodic within 30 inches  
 Available water capacity: 6.7 inches

## Vida Series

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landforms:* Till plains or hills  
*Parent material:* Glacial till  
*Slope range:* 0 to 15 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed Typic  
 Argiborolls

### Typical Pedon

Vida clay loam, 2 to 8 percent slopes, in a cropland area, 100 feet south and 400 feet east of the northwest corner of sec. 7, T. 37 N., R. 2 W.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; many fine roots and pores; mildly alkaline; abrupt smooth boundary.

Bt—4 to 9 inches; brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine angular blocky structure; hard, firm, sticky and plastic; common fine and medium roots and pores; common faint clay films on faces of peds and lining pores; mildly alkaline; clear wavy boundary.

Bk—9 to 30 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots and pores; many large irregularly shaped masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—30 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist, massive; hard, firm, sticky and plastic; few fine and medium roots and pores; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 4 to 40 inches  
*Mollic epipedon thickness:* 7 to 10 inches

*Content of clay in the control section:* 27 to 35 percent  
*Depth to Bk horizon:* 6 to 10 inches

### Ap horizon

Value: 3 or 4 dry; 2 or 3 moist  
 Chroma: 2 or 3  
 Clay content: 27 to 35 percent  
 Reaction: pH 6.6 to 8.4

### Bt horizon

Hue: 10YR  
 Value: 4 or 5 dry; 3 or 4 moist  
 Chroma: 2 or 3  
 Texture: Loam, clay loam, or clay  
 Clay content: 25 to 45 percent  
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Reaction: pH 6.6 to 7.8

### Bk horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 5 or 6 moist  
 Chroma: 2 or 3  
 Texture: Loam or clay loam  
 Clay content: 25 to 35 percent  
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Calcium carbonate equivalent: 5 to 15 percent  
 Reaction: pH 7.4 to 8.4

### C horizon

Hue: 10YR or 2.5Y  
 Value: 6 or 7 dry; 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Loam or clay loam  
 Clay content: 25 to 35 percent  
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles  
 Calcium carbonate equivalent: 2 to 12 percent  
 Gypsum: 0 to 5 percent  
 Reaction: pH 7.9 to 8.4

## 69A—Vida clay loam, 0 to 2 percent slopes

### Setting

Landform: Till plains  
 Slope: 0 to 2 percent

### Composition

#### Major Components

Vida and similar soils: 85 percent



**Minor Components**

Vida clay loam calcareous: 0 to 5 percent  
 Nishon and similar soils: 0 to 2 percent  
 Daglum and similar soils: 0 to 5 percent  
 Soils that have slopes more than 2 percent:  
 0 to 3 percent

***Major Component Description***

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

**69C—Vida clay loam, 2 to 8 percent slopes*****Setting***

Landform: Till plains  
 Slope: 2 to 8 percent

***Composition*****Major Components**

Vida and similar soils: 85 percent

**Minor Components**

Vida clay loam calcareous: 0 to 5 percent  
 Nishon and similar soils: 0 to 2 percent  
 Daglum and similar soils: 0 to 5 percent  
 Soils that have slopes more than 8 percent:  
 0 to 3 percent

***Major Component Description***

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

**692D—Vida, calcareous-Williams-Zahill clay loams, 4 to 15 percent slopes*****Setting***

Landforms: Vida, calcareous—hills; Williams—hills;  
 Zahill—hills

Position on landform: Vida, calcareous—back slopes; Williams—foot slopes; Zahill—shoulders  
 Slope: Vida, calcareous—4 to 8 percent;  
 Williams—4 to 8 percent; Zahill—8 to 15 percent

***Composition*****Major Components**

Vida, calcareous and similar soils: 45 percent  
 Williams and similar soils: 20 percent  
 Zahill and similar soils: 20 percent

**Minor Components**

Soils that have slopes more than 15 percent:  
 0 to 13 percent  
 Nishon and similar soils: 0 to 2 percent

***Major Component Description*****Vida, calcareous**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

**Williams**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 10.4 inches

**Zahill**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

**697C—Vida-Bearpaw clay loams, 2 to 8 percent slopes*****Setting***

Landforms: Vida—till plains; Bearpaw—till plains

Position on landform: Vida—back slopes;  
 Bearpaw—foot slopes  
 Slope: Vida—2 to 8 percent; Bearpaw—2 to 8 percent

### ***Composition***

#### **Major Components**

Vida and similar soils: 50 percent  
 Bearpaw and similar soils: 35 percent

#### **Minor Components**

Daglurn and similar soils: 0 to 7 percent  
 Nishon and similar soils: 0 to 2 percent  
 Soils that have slopes more than 8 percent:  
 0 to 6 percent

### ***Major Component Description***

#### **Vida**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

#### **Bearpaw**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.7 inches

### **698D—Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes**

#### ***Setting***

Landforms: Vida—hills; Bearpaw—till plains; Nishon—  
 closed depressions  
 Position on landform: Vida—shoulders;  
 Bearpaw—back slopes;  
 Slope: Vida—4 to 15 percent; Bearpaw—0 to 8  
 percent; Nishon—0 to 1 percent

### ***Composition***

#### **Major Components**

Vida and similar soils: 35 percent  
 Bearpaw and similar soils: 30 percent  
 Nishon and similar soils: 25 percent

#### **Minor Components**

Tinsley and similar soils: 0 to 4 percent  
 Vida gravelly clay loam: 0 to 3 percent  
 Soils that have slopes more than 15 percent:  
 0 to 3 percent

### ***Major Component Description***

#### **Vida**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

#### **Bearpaw**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.7 inches

#### **Nishon**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Poorly drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Ponding: Long  
 Available water capacity: 9.3 inches

### **691B—Vida-Vida, calcareous-Williams clay loams, 0 to 3 percent slopes**

#### ***Setting***

Landforms: Vida—till plains; Vida, calcareous—till  
 plains; Williams—till plains  
 Slope: Vida—0 to 3 percent; Vida, calcareous—0 to 3  
 percent; Williams—0 to 3 percent

### ***Composition***

#### **Major Components**

Vida and similar soils: 40 percent  
 Vida, calcareous and similar soils: 25 percent  
 Williams and similar soils: 20 percent

**Minor Components**

Zahill and similar soils: 0 to 7 percent

Nishon and similar soils: 0 to 2 percent

Soils that have slopes more than 3 percent:  
0 to 6 percent

***Major Component Description*****Vida**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

**Vida, calcareous**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

**Williams**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.4 inches

**691C—Vida-Vida, calcareous-Williams  
clay loams, 3 to 8 percent slopes*****Setting***

Landforms: Vida—till plains; Vida, calcareous—  
till plains; Williams—till plains

Position on landform: Vida—back slopes; Vida,  
calcareous—shoulders; Williams—foot slopes

Slope: Vida—3 to 8 percent; Vida, calcareous—3 to  
8 percent; Williams—3 to 8 percent

***Composition*****Major Components**

Vida and similar soils: 35 percent

Vida, calcareous and similar soils: 30 percent

Williams and similar soils: 20 percent

**Minor Components**

Zahill and similar soils: 0 to 7 percent

Nishon and similar soils: 0 to 2 percent

Soils that have slopes more than 8 percent:  
0 to 6 percent

***Major Component Description*****Vida**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

**Vida, calcareous**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

**Williams**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.4 inches

**694C—Vida-Williams clay loams, 3 to 8  
percent slopes*****Setting***

Landforms: Vida—till plains; Williams—till  
plains

Position on landform: Vida—back slopes;  
Williams—foot slopes

Slope: Vida—3 to 8 percent; Williams—3 to 8  
percent

***Composition*****Major Components**

Vida and similar soils: 50 percent

Williams and similar soils: 35 percent

**Minor Components**

Soils that have slopes more than 8 percent:  
 0 to 7 percent  
 Nishon and similar soils: 0 to 2 percent  
 Soils that have slopes less than 3 percent:  
 0 to 6 percent

***Major Component Description*****Vida**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

**Williams**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 10.4 inches

**695D—Vida-Williams-Zahill clay loams,  
4 to 15 percent slopes*****Setting***

Landforms: Vida—hills; Williams—hills; Zahill—hills  
 Position on landform: Vida—back slopes; Williams—foot slopes; Zahill—shoulders  
 Slope: Vida—4 to 8 percent; Williams—4 to 8 percent; Zahill—8 to 15 percent

***Composition*****Major Components**

Vida and similar soils: 35 percent  
 Williams and similar soils: 30 percent  
 Zahill and similar soils: 20 percent

**Minor Components**

Soils that have slopes more than 15 percent:  
 0 to 13 percent  
 Nishon and similar soils: 0 to 2 percent

***Major Component Description*****Vida**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

**Williams**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 10.4 inches

**Zahill**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

**696E—Vida-Zahill clay loams, 8 to 25  
percent slopes*****Setting***

Landforms: Vida—hills; Zahill—hills  
 Position on landform: Vida—back slopes; Zahill—shoulders  
 Slope: Vida—8 to 15 percent; Zahill—15 to 25 percent

***Composition*****Major Components**

Vida and similar soils: 50 percent  
 Zahill and similar soils: 35 percent

**Minor Components**

Soils that have slopes less than 8 percent:  
 0 to 8 percent  
 Reeder and similar soils: 0 to 7 percent

***Major Component Description*****Vida**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

#### **Zahill**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

### **698E—Vida-Zahill-Nishon clay loams, 0 to 25 percent slopes**

#### ***Setting***

Landforms: Vida—hills; Zahill—hills; Nishon—closed depressions  
 Position on landform: Vida—foot slopes; Zahill—shoulders  
 Slope: Vida—0 to 15 percent; Zahill—15 to 25 percent; Nishon—0 to 1 percent

#### ***Composition***

#### **Major Components**

Vida and similar soils: 35 percent  
 Zahill and similar soils: 30 percent  
 Nishon and similar soils: 25 percent

#### **Minor Components**

Tinsley and similar soils: 0 to 4 percent  
 Soils that have slopes more than 25 percent: 0 to 3 percent  
 Vida gravelly clay loam: 0 to 3 percent

#### ***Major Component Description***

#### **Vida**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

#### **Zahill**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)

Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

#### **Nishon**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Poorly drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Ponding: Long  
 Available water capacity: 9.3 inches

### **W—Water**

#### ***Composition***

#### **Major Components**

Water: 100 percent

#### ***Major Component Description***

*Definition:* Areas of open water

### **Whitlash Series**

*Depth class:* Shallow (10 to 20 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Mountains  
*Parent material:* Colluvium  
*Slope range:* 8 to 70 percent  
*Annual precipitation:* 18 to 22 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 70 to 105 days

**Taxonomic Class:** Loamy-skeletal, mixed Lithic Haploborolls

#### **Typical Pedon**

Whitlash cobbly loam in an area of Perma-Whitlash cobbly loams, 8 to 25 percent slopes; in a rangeland area, 2,200 feet south and 100 feet west of the northeast corner of sec. 18, T. 36 N., R. 3 E.

A—0 to 9 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 20 percent cobbles and 15 percent pebbles; neutral; clear smooth boundary.

Bw—9 to 19 inches; grayish brown (10YR 5/2) extremely cobbly loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 50 percent cobbles and 25 percent pebbles; neutral; gradual smooth boundary.

R—19 to 60 inches; hard, fractured igneous bedrock.

#### Range in Characteristics

*Control section:* 10 to 19 inches

*Mollic epipedon thickness:* 7 to 15 inches

*Content of clay in the control section:* 10 to 27 percent

*Depth to bedrock:* 10 to 20 inches

#### A horizon

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1, 2, or 3

Clay content: 10 to 27 percent, less than 35 percent fine and coarser sand

Rock fragments: 15 to 35 percent—5 to 15 percent pebbles and channers, 10 to 30 percent cobbles, flagstones, and stones

Reaction: pH 6.1 to 7.3

#### Bw horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam, sandy clay loam, or sandy loam

Clay content: 10 to 27 percent, less than 35 percent fine and coarser sand

Rock fragments: 35 to 80 percent—15 to 60 percent pebbles and channers, 5 to 50 percent cobbles, flagstones, and stones

Reaction: pH 6.1 to 7.3

**Note:** Some pedons have a C horizon.

### Williams Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landforms:* Till plains or hills

*Parent material:* Glacial till

*Slope range:* 0 to 8 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed Typic Argiborolls

#### Typical Pedon

Williams clay loam, 0 to 3 percent slopes, in a

cropland area, 1,000 feet south and 2,400 feet west of the northeast corner of sec. 23, T. 37 N., R. 1 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure parting to weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; neutral; abrupt smooth boundary.

Bt1—5 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and common very fine and fine pores; common faint clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bt2—8 to 13 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bk—13 to 18 inches; light grayish brown (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and few very fine and fine pores; common soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C—18 to 60 inches; light grayish brown (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 5 to 13 inches

*Mollic epipedon thickness:* 7 to 15 inches

*Content of clay in the control section:* 22 to 35 percent

*Depth to Bk horizon:* 10 to 30 inches

#### Ap horizon

Hue: 10YR

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 (some pedons in native grassland have a moist chroma of less than 1.5 in the upper 1 to 3 inches)

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 7.8

#### Bt horizons

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 2, 3, 4, or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Loam or clay loam  
 Clay content: 22 to 35 percent clay  
 Reaction: pH 6.6 to 7.8

**Bk horizon**

Hue: 10YR, 2.5Y, or 5Y  
 Value: 4, 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Loam or clay loam  
 Clay content: 22 to 35 percent  
 Reaction: pH 7.9 to 8.4  
**Note:** Some pedons have a BC or BCk horizon.

**C horizon**

Hue: 10YR, 2.5Y, or 5Y  
 Value: 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist  
 Chroma: 2, 3, or 4  
 Texture: Loam or clay loam  
 Clay content: 22 to 35 percent  
 Reaction: pH 7.9 to 8.4

**80B—Williams clay loam, 0 to 3 percent slopes**

***Setting***

Landform: Till plains  
 Slope: 0 to 3 percent

***Composition***

**Major Components**

Williams and similar soils: 85 percent

**Minor Components**

Daglum and similar soils: 0 to 5 percent  
 Nishon and similar soils: 0 to 2 percent  
 Vida and similar soils: 0 to 4 percent  
 Soils that have slopes more than 3 percent:  
 0 to 4 percent

***Major Component Description***

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 10.4 inches

**80C—Williams clay loam, 3 to 8 percent slopes**

***Setting***

Landform: Till plains  
 Slope: 3 to 8 percent

***Composition***

**Major Components**

Williams and similar soils: 85 percent

**Minor Components**

Daglum and similar soils: 0 to 5 percent  
 Nishon and similar soils: 0 to 2 percent  
 Vida and similar soils: 0 to 4 percent  
 Soils that have slopes more than 8 percent:  
 0 to 4 percent

***Major Component Description***

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 10.4 inches

**Yamacall Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Moderate (0.6 to 2.0 inches/hour)  
*Landform:* Alluvial fans  
*Parent material:* Alluvium  
*Slope range:* 0 to 15 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Fine-loamy, mixed, frigid Aridic  
 Ustochrepts

**Typical Pedon**

Yamacall loam, 0 to 4 percent slopes, in a cropland area, 1,500 feet south and 2,200 feet west of the northeast corner of sec. 27, T. 33 N., R. 3 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; medium very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very

fine and fine roots and many very fine continuous pores; moderately alkaline; clear smooth boundary.

**Bw**—6 to 13 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and continuous pores; moderately alkaline; clear smooth boundary.

**Bk1**—13 to 18 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine roots and common very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

**Bk2**—18 to 35 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure; slightly hard, friable, nonsticky and slightly plastic; many fine roots and common very fine pores; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

**C**—35 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, nonsticky and slightly plastic; common very fine pores; strongly effervescent; moderately alkaline.

### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 18 to 30 percent

*Depth to the Bk horizon:* 10 to 20 inches

#### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

**Note:** This horizon when mixed to 7 inches will not meet the requirements for a mollic epipedon.

#### Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silt loam

Clay content: 18 to 35 percent, 15 to 35 percent fine sand and coarser

Reaction: pH 6.6 to 8.4

#### Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silt loam

Clay content: 18 to 35 percent, 15 to 35 percent fine sand and coarser

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

#### BC horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, sandy loam, clay loam, or

silt loam; in some pedons below a depth of 40 inches the material consists of strata of loam, silt loam, sandy loam, or loamy sand

Clay content: 10 to 30 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

## 79B—Yamacall loam, 0 to 4 percent slopes

### Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

### Composition

#### Major Components

Yamacall and similar soils: 85 percent

#### Minor Components

Yamac loam calcareous: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Soils that have slopes more than 4 percent: 0 to 5 percent

### Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.3 inches



### **79C—Yamacall loam, 4 to 8 percent slopes**

#### ***Setting***

Landform: Alluvial fans

Slope: 4 to 8 percent

#### ***Composition***

##### **Major Components**

Yamacall and similar soils: 90 percent

##### **Minor Components**

Yamac loam calcareous: 0 to 4 percent

Yetull and similar soils: 0 to 3 percent

Soils that have slopes more than 8 percent:  
0 to 3 percent

#### ***Major Component Description***

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.3 inches

### **79D—Yamacall loam, 8 to 15 percent slopes**

#### ***Setting***

Landform: Alluvial fans

Slope: 8 to 15 percent

#### ***Composition***

##### **Major Components**

Yamacall and similar soils: 85 percent

##### **Minor Components**

Yamacall loam, calcareous: 0 to 5 percent

Delpoint and similar soils: 0 to 5 percent

Soils that have slopes more than 15 percent:  
0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.3 inches

### **793B—Yamacall loam, calcareous, 0 to 4 percent slopes**

#### ***Setting***

Landform: Alluvial fans

Slope: 0 to 4 percent

#### ***Composition***

##### **Major Components**

Yamacall and similar soils: 85 percent

##### **Minor Components**

Soils that have noncalcareous surface layers:  
0 to 5 percent

Trudau and similar soils: 0 to 5 percent

Soils that have slopes more than 4 percent:  
0 to 5 percent

#### ***Major Component Description***

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.7 inches

### **793C—Yamacall loam, calcareous, 4 to 8 percent slopes**

#### ***Setting***

Landform: Alluvial fans

Slope: 4 to 8 percent

#### ***Composition***

##### **Major Components**

Yamacall and similar soils: 85 percent

##### **Minor Components**

Soils that have noncalcareous surface layers:  
0 to 5 percent

Trudau and similar soils: 0 to 5 percent

Soils that have slopes more than 8 percent:  
0 to 5 percent

**Major Component Description**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.7 inches

**793D—Yamacall loam, calcareous, 8 to 15 percent slopes****Setting**

Landform: Alluvial fans  
 Slope: 8 to 15 percent

**Composition****Major Components**

Yamacall and similar soils: 85 percent

**Minor Components**

Soils that have noncalcareous surface layers:  
 0 to 5 percent  
 Delpoint and similar soils: 0 to 5 percent  
 Soils that have slopes more than 15 percent:  
 0 to 5 percent

**Major Component Description**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Alluvium  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.7 inches

**Yetull Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Somewhat excessively drained  
*Permeability:* Rapid (6.0 to 20.0 inches/hour)  
*Landform:* Dunes  
*Parent material:* Eolian deposits  
*Slope range:* 0 to 15 percent  
*Annual precipitation:* 10 to 14 inches  
*Annual air temperature:* 42 to 45 degrees F  
*Frost-free period:* 105 to 125 days

**Taxonomic Class:** Mixed, frigid Ustic Torripsamments

**Typical Pedon**

Yetull loamy fine sand, 0 to 15 percent slopes, in a rangeland area, 1,800 feet south and 200 feet west of the northeast corner of sec. 10, T. 31 N., R. 4 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; mildly alkaline; abrupt smooth boundary.

C1—4 to 8 inches; light brownish gray (10YR 6/2) sand, brown (10YR 5/3) moist; single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; strongly effervescent; mildly alkaline; clear smooth boundary.

C2—8 to 20 inches; brown (10YR 5/3) loamy sand, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; violently effervescent; moderately alkaline; gradual smooth boundary.

C3—20 to 60 inches; brown (10YR 5/3) sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; strongly effervescent; moderately alkaline.

**Range in Characteristics**

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 0 to 10 percent

**A horizon**

Hue: 10YR or 2.5Y  
 Value: 5 or 6 dry; 3 or 4 moist  
 Chroma: 2, 3, or 4  
 Clay content: 0 to 10 percent  
 Reaction: pH 6.6 to 7.8

**C horizons**

Hue: 10YR or 2.5Y  
 Value: 4, 5, or 6 dry; 4 or 5 moist  
 Chroma: 2, 3, or 4  
 Texture: Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand  
 Clay content: 0 to 10 percent  
 Reaction: pH 7.4 to 8.4  
**Note:** Finer textured material below depths of 40 inches is allowed.

### 73D—Yetull loamy fine sand, 0 to 15 percent slopes

#### Setting

Landform: Sand dunes

Slope: 0 to 15 percent

#### Composition

##### Major Components

Yetull and similar soils: 85 percent

##### Minor Components

Yetull sandy loam: 0 to 8 percent

Lihen and similar soils: 0 to 7 percent

#### Major Component Description

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 3.6 inches

#### Zahill Series

*Depth class:* Very deep (greater than 60 inches)

*Drainage class:* Well drained

*Permeability:* Slow (0.06 to 0.2 inch/hour)

*Landforms:* Hills or large drainageways

*Parent material:* Glacial till

*Slope range:* 8 to 65 percent

*Annual precipitation:* 13 to 17 inches

*Annual air temperature:* 41 to 44 degrees F

*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed (calcareous), frigid Typic Ustorthents

#### Typical Pedon

Zahill clay loam in an area of Vida-Williams-Zahill clay loams, 4 to 15 percent slopes; in a rangeland area, 1,800 feet north and 100 feet west of the southeast corner of sec. 5, T. 37 N., R. 2 W.

A—0 to 5 inches; light gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, sticky and plastic; many very fine and fine roots and pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bk—5 to 20 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak

medium prismatic structure parting to weak fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and pores; few fine soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C—20 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Control section:* 10 to 40 inches

*Content of clay in the control section:* 20 to 35 percent

##### A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Reaction: pH 7.4 to 8.4

##### Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles, 0 to 10 percent pebbles

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.4 to 8.4

##### C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles, 0 to 10 percent pebbles

Gypsum: 1 to 5 percent

Reaction: pH 7.4 to 9.0

### 72F—Zahill loam, 25 to 45 percent slopes

#### Setting

Landform: Hills

Slope: 25 to 45 percent

***Composition*****Major Components**

Zahill and similar soils: 85 percent

**Minor Components**

Zahl and similar soils: 0 to 5 percent

Cabba and similar soils: 0 to 4 percent

Doney and similar soils: 0 to 3 percent

Dast and similar soils: 0 to 3 percent

***Major Component Description***

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.7 inches

**722F—Zahill-Dast-Cabba complex, 25 to 65 percent slopes*****Setting***

Landforms: Zahill—hills; Dast—hills; Cabba—hills

Position on landform: Zahill—shoulders; Dast—foot slopes; Cabba—back slopes

Slope: Zahill—45 to 65 percent; Dast—25 to 45 percent; Cabba—25 to 45 percent

***Composition*****Major Components**

Zahill and similar soils: 35 percent

Dast and similar soils: 30 percent

Cabba and similar soils: 20 percent

**Minor Components**

Soils that have slopes less than 25 percent:  
0 to 10 percent

Rock outcrop: 0 to 5 percent

***Major Component Description*****Zahill**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

**Dast**

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 3.8 inches

**Cabba**

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.3 inches

**721E—Zahill-Zahl complex, 15 to 25 percent slopes*****Setting***

Landforms: Zahill—hills; Zahl—hills

Position on landform: Zahill—shoulders; Zahl—back slopes

Slope: Zahill—15 to 25 percent; Zahl—15 to 25 percent

***Composition*****Major Components**

Zahill and similar soils: 60 percent

Zahl and similar soils: 25 percent

**Minor Components**

Cabba and similar soils: 0 to 5 percent

Doney and similar soils: 0 to 5 percent

Dast and similar soils: 0 to 5 percent

***Major Component Description*****Zahill**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

**Zahl**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.5 inches

**721F—Zahill-Zahl complex, 25 to 60 percent slopes**
**Setting**

Landforms: Zahill—hills; Zahl—hills  
 Position on landform: Zahill—shoulders; Zahl—back slopes  
 Slope: Zahill—45 to 60 percent; Zahl—25 to 45 percent

**Composition****Major Components**

Zahill and similar soils: 60 percent  
 Zahl and similar soils: 25 percent

**Minor Components**

Soils that have slopes less than 25 percent: 0 to 5 percent  
 Cabba and similar soils: 0 to 4 percent  
 Doney and similar soils: 0 to 3 percent  
 Dast and similar soils: 0 to 3 percent

**Major Component Description****Zahill**

Surface layer texture: Clay loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 9.6 inches

**Zahl**

Surface layer texture: Loam  
 Depth class: Very deep (more than 60 inches)  
 Drainage class: Well drained  
 Dominant parent material: Till  
 Native plant cover type: Rangeland  
 Flooding: None  
 Available water capacity: 8.5 inches

**Zahl Series**

*Depth class:* Very deep (greater than 60 inches)  
*Drainage class:* Well drained  
*Permeability:* Slow (0.06 to 0.2 inch/hour)  
*Landforms:* Hills or large drainageways  
*Parent material:* Glacial till  
*Slope range:* 15 to 60 percent  
*Annual precipitation:* 13 to 17 inches  
*Annual air temperature:* 41 to 44 degrees F  
*Frost-free period:* 90 to 105 days

**Taxonomic Class:** Fine-loamy, mixed Typic Calciborolls

**Typical Pedon**

Zahl loam in an area of Zahill-Zahl complex, 25 to 60 percent slopes; in a rangeland area, 1,900 feet south and 2,100 feet west of the northeast corner of sec. 20, T. 37 N., R. 1 E.

- A1—0 to 4 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; soft, friable, sticky and plastic; many very fine and fine roots and pores; mildly alkaline; clear wavy boundary.
- A2—4 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark gray (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and pores; mildly alkaline; clear wavy boundary.
- Bk—8 to 17 inches; gray (2.5Y 6/2) clay loam, dark gray (2.5Y 4/2) moist; massive; slightly hard, firm, sticky and plastic; many very fine and fine roots and pores; common fine and medium soft masses of lime; strongly effervescent; mildly alkaline; clear smooth boundary.
- C—17 to 60 inches; gray (2.5Y 5/2) clay loam, dark gray (2.5Y 4/2) moist; massive; slightly hard, firm, sticky and plastic; common very fine and fine roots and pores; strongly effervescent; mildly alkaline.

**Range in Characteristics**

*Control section:* 10 to 40 inches  
*Mollic epipedon thickness:* 7 to 16 inches  
*Content of clay in the control section:* 20 to 30 percent  
*Depth to Bk horizon:* 5 to 17 inches

**A horizons**

Hue: 10YR or 2.5Y  
 Value: 3, 4, or 5 dry; 2 or 3 moist  
 Chroma: 2 (some pedons have a thin A horizon with a chroma of 1)

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

**Note:** Some pedons have an AB horizon.

*Bk horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 3, 4, 5, 6, or 7 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Reaction: pH 7.4 to 8.4

**Note:** Relict mottles in some pedons; some pedons have a BCK horizon.

*C horizon*

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Reaction: pH 7.4 to 8.4

**Note:** Does not have relict mottles in some pedons; some pedons have thin layers of gravel or gravelly sandy loam; some pedons have shale bedrock below a depth of 40 inches.



## References

---

- Alexander, R.R. 1966. Site indexes for lodgepole pine with corrections for stand density. U.S. Dep. Agric., Forest Serv., Res. Pap. RM-24.
- American Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 14, 2 vols.
- American Society for Testing and Materials. 1993. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.
- Colton, Roger B., Richard W. Lemke, and Robert M. Lindral. 1961. Glacial map of Montana east of the Rocky Mountains. U.S. Geol. Surv., Misc. Geol. Invest. Map I-327.
- Dahms, W. G. 1964. Gross and net yields for lodgepole pine. U.S. Dep. Agric., Forest Serv., Res. Pap. PNW-8.
- Meyers, C. A. 1966. Yield tables for managed stands of lodgepole pine in Colorado and Wyoming. U.S. Dep. Agric., Forest Serv., Rocky Mountain For. and Range Exp. Stn. Res. Pap. RM-26.
- United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210
- United States Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436.





# Glossary

---

**Ablation till.** Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alluvial fan.** A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Animal-unit-month (AUM).** The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

**Area reclaim** (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Argillite.** Weakly metamorphosed mudstone or shale.

**Association, soil.** A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low ..... 0 to 3.75

Low ..... 3.75 to 5.0

Moderate ..... 5.0 to 7.5

High ..... more than 7.5

**Avalanche chute.** The track or path formed by an avalanche.

**Back slope.** The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

**Badland.** Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

**Basal area.** The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

**Basal till.** Compact glacial till deposited beneath the ice.

**Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

**Bedding planes.** Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bedrock-floored plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

**Bench terrace.** A raised, level or nearly level strip of earth constructed on or nearly on a contour,

supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

**Blowout.** A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

**Board foot.** A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board one foot wide, one foot long, and one inch thick before finishing.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Breaks.** The steep or very steep broken land at the border of an upland summit that is dissected by ravines.

**Breast height.** An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

**Brush management.** Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

**Cable yarding.** A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

**California bearing ratio (CBR).** The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be

supported by standard crushed limestone, per unit area, with the same degree of distortion.

**Canopy.** The leafy crown of trees or shrubs. (See Crown.)

**Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

**Catsteps.** Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

**Channeled.** Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

**Channery soil.** A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

**Chemical treatment.** Control of unwanted vegetation by use of chemicals.

**Chiseling.** Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

**Cirque.** A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clayey soil.** Silty clay, sandy clay, or clay.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

**Claypan.** A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

**Clearcut.** A method of forest harvesting that removes the entire stand of trees in one cutting.

Reproduction is achieved artificially or by natural seeding from adjacent stands.

**Climax plant community.** The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

**Closed depression.** A low area completely surrounded by higher ground and having no natural outlet.

**Coarse textured soil.** Sand or loamy sand.

**Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Cobbly soil material.** Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

**Codominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

**Colluvium.** Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Commercial forest.** Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

**Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

**Compressible** (in tables). Excessive decrease in volume of soft soil under load.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Conglomerate.** A coarse grained, clastic rock composed of rounded to subangular rock

fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

**Conservation cropping system.** Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

**Conservation tillage.** Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Consolidated sandstone.** Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very

hard when dry, are not easily crushed, and cannot be textured by the usual field method.

**Consolidated shale.** Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

**Contour stripcropping (or contour farming).** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

**Coprogenous earth (sedimentary peat).** Fecal material deposited in water by aquatic organisms.

**Corrosion.** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

**Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

**Cropping system.** Growing crops according to a planned system of rotation and management practices.

**Crop residue management.** Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

**Cross-slope farming.** Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

**Crown.** The upper part of a tree or shrub, including the living branches and their foliage.

**Culmination of mean annual increment (CMAI).** The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of mean annual increment.

**Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.

**Decreasers.** The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

**Deep soil.** A soil that is 40 to 60 inches deep over

bedrock or to other material that restricts the penetration of plant roots.

**Deferred grazing.** Postponing grazing or resting grazing land for a prescribed period.

**Dense layer** (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

**Depth to rock** (in tables). Bedrock is too near the surface for the specified use.

**Dip slope.** A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Divided-slope farming.** A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.

**Dominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

**Drainage class (natural).** Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

*Somewhat excessively drained.*—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

*Well drained.*—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

*Moderately well drained.*—These soils are wet

close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

*Somewhat poorly drained.*—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

*Poorly drained.*—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

*Very poorly drained.*—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Drainageway.** An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

**Drumlin.** A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

**Duff.** A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

**Dune.** A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

**Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material

through eluviation are eluvial; those that have received material are illuvial.

**Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

**Ephemeral stream.** A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion (geologic).* Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

*Erosion (accelerated).* Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

**Erosion pavement.** A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

**Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

**Esker.** A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

**Even aged.** Refers to a stand of trees in which only small differences in age occur between the individuals. A range of 20 years is allowed.

**Excess fines** (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

**Excess lime** (in tables). Excess carbonates in the soil that restrict the growth of some plants.

**Excess salts** (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

**Excess sodium** (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

**Excess sulfur** (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

**Extrusive rock.** Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

**Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

**Fast intake** (in tables). The rapid movement of water into the soil.

**Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fine textured soil.** Sandy clay, silty clay, or clay.

**Firebreak.** An area cleared of flammable material to stop or help control creeping or running fires. A firebreak also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

**First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.

**Flaggy soil material.** Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

**Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is

usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.

**Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.

**Foothills.** A region of relatively low, rounded hills at the base of a mountain range.

**Foot slope.** The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

**Forb.** Any herbaceous plant not a grass or a sedge.

**Forest cover.** All trees and other woody plants (underbrush) covering the ground in a forest.

**Forest type.** A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

**Fragile** (in tables). A soil that is easily damaged by use or disturbance.

**Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

**Frost action** (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

**Giant ripple mark.** The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

**Glacial drift (geology).** Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

**Glacial outwash (geology).** Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

**Glacial till (geology).** Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

**Glaciated uplands.** Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

**Glaciofluvial deposits (geology).** Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

**Glaciolacustrine deposits.** Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

**Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

**Green manure crop (agronomy).** A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water (geology).** Water filling all the unblocked pores of the material below the water table.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. A gullied map unit is one that has numerous gullies.

**Gypsum.** A mineral consisting of hydrous calcium sulfate.

**Habitat type.** An aggregation of all land areas capable of producing similar climax plant communities.

**Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

**Hardpan.** A hardened or cemented soil horizon, or

layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Head out.** To form a flower head.

**Heavy metal.** Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

**Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

**High-residue crops.** Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

**Hill.** A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:  
*O horizon.*—An organic layer of fresh and decaying plant residue.

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.



**C horizon.**—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

**Cr horizon.**—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

**R layer.**—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Igneous rock.** Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Increasers.** Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as

contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2 .....	very low
0.2 to 0.4 .....	low
0.4 to 0.75 .....	moderately low
0.75 to 1.25 .....	moderate
1.25 to 1.75 .....	moderately high
1.75 to 2.5 .....	high
More than 2.5 .....	very high

**Intermittent stream.** A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

**Invaders.** On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

**Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are:

**Basin.**—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

**Border.**—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

**Controlled flooding.**—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

**Corrugation.**—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

**Drip (or trickle).**—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

**Furrow.**—Water is applied in small ditches made

by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

*Subirrigation.*—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

*Wild flooding.*—Water, released at high points, is allowed to flow onto an area without controlled distribution.

**Kame.** A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

**Kame terrace.** A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

**Lacustrine deposit (geology).** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

**Lake plain.** A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

**Landslide.** The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

**Large stones** (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

**Lateral moraine.** A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

**Leaching.** The removal of soluble material from soil or other material by percolating water.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loamy soil.** Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by the wind.

**Low-residue crops.** Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

**Low strength.** The soil is not strong enough to support loads.

**Marl.** An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

**Mean annual increment (MAI).** The average annual increase in volume of a tree during the entire life of the tree.

**Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Merchantable trees.** Trees that are of sufficient size to be economically processed into wood products.

**Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

**Microhigh.** An area that is 2 to 12 inches higher than the adjacent microlow.

**Microlow.** An area that is 2 to 12 inches lower than the adjacent microhigh.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Miscellaneous water.** A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately deep soil.** A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Moraine.** An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—

*few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

**Mountain.** A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.

**Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

**Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

**Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

**Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Observed rooting depth.** Depth to which roots have been observed to penetrate.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**Outwash plain.** An extensive area of glaciofluvial material that was deposited by meltwater streams.

**Overstory.** The trees in a forest that form the upper crown cover.

**Oxbow.** The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

**Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Percs slowly** (in tables). The slow movement of water through the soil, adversely affecting the specified use.

**Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow .....	less than 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow .....	0.2 to 0.6 inch
Moderate .....	0.6 inch to 2.0 inches
Moderately rapid .....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid .....	more than 20 inches

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Playa.** The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

**Plowpan.** A compacted layer formed in the soil directly below the plowed layer.

**Ponding.** Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

**Poor filter** (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

**Poorly graded.** Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Poor outlets** (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

**Potential native plant community.** See Climax plant community.

**Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

**Prescribed burning.** The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Proper grazing use.** Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

**Quartzite, metamorphic.** Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

**Quartzite, sedimentary.** Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

**Range condition.** The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

**Rangeland.** Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or

browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

**Range site.** An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid .....	less than 3.5
Extremely acid .....	3.5 to 4.4
Very strongly acid .....	4.5 to 5.0
Strongly acid .....	5.1 to 5.5
Moderately acid .....	5.6 to 6.0
Slightly acid .....	6.1 to 6.5
Neutral .....	6.6 to 7.3
Slightly alkaline .....	7.4 to 7.8
Moderately alkaline .....	7.9 to 8.4
Strongly alkaline .....	8.5 to 9.0
Very strongly alkaline .....	9.1 and higher

**Recessional moraine.** A moraine formed during a temporary but significant halt in the retreat of a glacier.

**Red beds.** Sedimentary strata mainly red in color and composed largely of sandstone and shale.

**Regeneration.** The new growth of a natural plant community, developing from seed.

**Regolith.** The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

**Relict stream terrace.** One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

**Riser.** The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

**Riverwash.** Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rock outcrop.** Exposures of bare bedrock other than lava flows and rock-lined pits.

**Rooting depth** (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Rubble land.** Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Saline soil.** A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

**Salinity.** The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline .....	0 to 4
Slightly saline .....	4 to 8
Moderately saline .....	8 to 16
Strongly saline .....	more than 16

**Salty water** (in tables). Water that is too salty for consumption by livestock.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-sized particles.

**Sandy soil.** Sand or loamy sand.

**Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

**Sawlogs.** Logs of suitable size and quality for the production of lumber.

**Scarification.** The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

**Scribner's log rule.** A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

**Sedimentary plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Sedimentary uplands.** Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

**Seepage** (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

**Semiconsolidated sedimentary beds.** Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

**Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

**Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**Shale.** Sedimentary rock formed by the hardening of a clay deposit.

**Shallow soil.** A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

**Shelterwood system.** A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

**Shoulder.** The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

**Shrink-swell** (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silica.** A combination of silicon and oxygen. The mineral form is called quartz.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

**Sinkhole.** A depression in the landscape where limestone has been dissolved.

**Site class.** A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

**Site curve (50-year).** A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

**Site curve (100-year).** A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or

dominant and codominant trees that are 100 years old or are 100 years old at breast height.

**Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

**Skid trails.** Pathways along which logs are dragged to a common site for loading onto a logging truck.

**Slash.** The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

**Slickens.** Accumulations of fine-textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

**Slickensides.** Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

**Slick spot.** A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

**Slippage** (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level .....	0 to 2 percent
Gently sloping .....	2 to 4 percent
Moderately sloping .....	4 to 8 percent
Strongly sloping .....	8 to 15 percent
Moderately steep .....	15 to 25 percent
Steep .....	25 to 45 percent
Very steep .....	more than 45 percent

**Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

**Slow intake** (in tables). The slow movement of water into the soil.

**Slow refill** (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

**Small stones** (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Sodic (alkali) soil.** A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

**Sodicity.** The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of  $\text{Na}^+$  to  $\text{Ca}^{++} + \text{Mg}^{++}$ . The degrees of sodicity and their respective ratios are:

Slight .....	less than 13:1
Moderate .....	13-30:1
Strong .....	more than 30:1

**Soft bedrock.** Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand .....	2.0 to 1.0
Coarse sand .....	1.0 to 0.5
Medium sand .....	0.5 to 0.25
Fine sand .....	0.25 to 0.10
Very fine sand .....	0.10 to 0.05
Silt .....	0.05 to 0.002
Clay .....	less than 0.002

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

**Species.** A single, distinct kind of plant or animal having certain distinguishing characteristics.

**Stone line.** A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

**Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

**Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Strath terrace.** A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

**Stream channel.** The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

**Stream terrace.** One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (*vertical axis of aggregates longer than horizontal*), columnar (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects from soil blowing and erosion by water after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling.** Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Technically, the E horizon. Generally refers to a leached horizon lighter in



color and lower in content of organic matter than the overlying surface layer.

**Summer fallow.** The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

**Summit.** A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Tailwater.** The water directly downstream of a structure.

**Talus.** Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

**Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace (geologic).** An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and

*clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer** (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

**Till plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

**Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Toe slope.** The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

**Too arid** (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Toxicity** (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soil in extremely small amounts. They are essential for plant growth.

**Trafficability.** The degree to which a soil is capable of supporting vehicular traffic across a wide range of soil moisture conditions.

**Tread.** The relatively flat terrace surface that was or built by stream or wave action.

**Tuff.** A compacted deposit that is 50 percent or more volcanic ash and dust.

**Understory.** Any plants in a forest community that grow to a height of less than 5 feet.

**Unstable fill** (in tables). Risk of caving or sloughing on banks of fill material.

**Upland (geology).** Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Valley.** An elongated depressional area primarily developed by stream action.

**Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

**Variegation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

**Varve.** A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within



a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

**Very deep soil.** A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Very shallow soil.** A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Water bars.** Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

**Waterspreading.** Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**Windthrow.** The action of uprooting and tipping over trees by the wind.

# Accessibility Statement

---

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at [ServiceDesk-FTC@ftc.usda.gov](mailto:ServiceDesk-FTC@ftc.usda.gov). For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

The USDA Target Center can convert USDA information and documents into alternative formats, including Braille, large print, video description, diskette, and audiotape. For more information, visit the TARGET Center's Web site (<http://www.targetcenter.dm.usda.gov/>) or call (202) 720-2600 (Voice/TTY).

## **Nondiscrimination Policy**

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

## **To File an Employment Complaint**

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (<http://directives.sc.egov.usda.gov/33081.wba>) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at [http://www.ascr.usda.gov/complaint\\_filing\\_file.html](http://www.ascr.usda.gov/complaint_filing_file.html).

## **To File a Program Complaint**

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at [http://www.ascr.usda.gov/complaint\\_filing\\_cust.html](http://www.ascr.usda.gov/complaint_filing_cust.html) or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to [program.intake@usda.gov](mailto:program.intake@usda.gov).

## **Persons with Disabilities**

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).



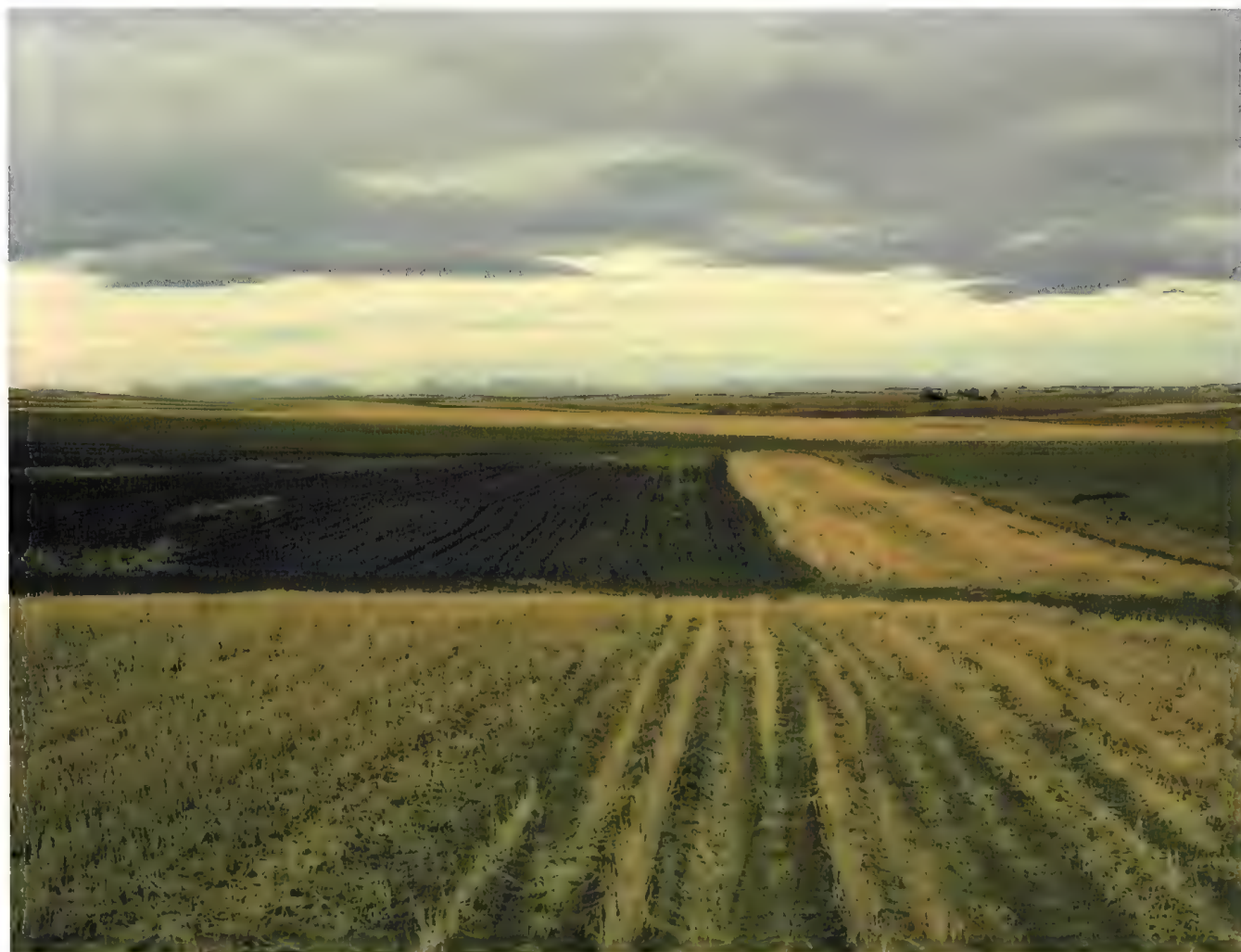
United States  
Department of  
Agriculture

Natural Resources  
Conservation  
Service

In cooperation with the  
Montana Agricultural  
Experiment Station

# Soil Survey of Toole County, Montana

## Part II





# How to Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

## Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

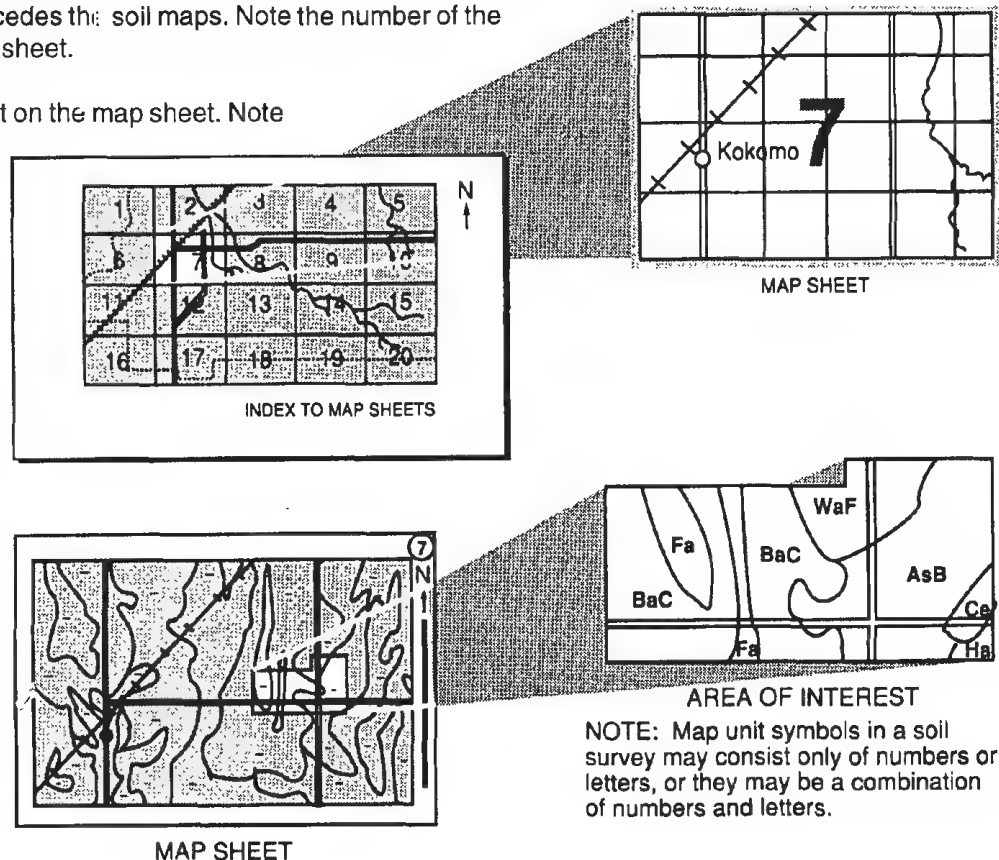
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

**A State Soil Geographic Data Base (STATSGO)** is available for this survey area. This

data base consists of a soils map at a scale of 1:250,000 along with groups of associated soils. It replaces the general soils map published in older surveys. This map and its data base can be useful for planning multi-county areas and map output can be tailored for specific use. For more information about the State Soil Geographic Data Base for this survey area, or for any portion of Montana, contact your local Natural Resources Conservation Service office.



---

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Toole County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

**Cover:** Typical area of strip cropping on Telstad-Joplin loams, 0 to 4 percent slopes.

*Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is <http://www.nrcs.usda.gov> (click on "Technical Resources").*

# Contents

---

## Part I

<b>Index to Series</b> .....	6
<b>Index to Soil Map Units</b> .....	8
<b>Summary of Tables</b> .....	13
<b>Foreword</b> .....	15
How This Survey Was Made .....	17
General Nature of the Survey Area .....	18
History, Settlement, and Farming .....	18
Markets and Transportation .....	19
Physiography, Relief, and Drainage .....	19
Natural Resources .....	19
Geology and Geomorphology .....	20
Climate .....	22
<b>Formation and Classification</b> .....	29
Formation of the Soils .....	29
Classification of the Soils .....	30
<b>Soil Series and Detailed Soil Map Units</b> .....	39
<b>References</b> .....	185
<b>Glossary</b> .....	187

## Part II

<b>Detailed Soil Map Unit Legend</b> .....	6
<b>Summary of Tables</b> .....	10
<b>Agronomy</b> .....	21
Cropland Limitations and Hazards .....	21
Crop Yield Estimates .....	22
Crops and Pasture of Toole County .....	23
Land Capability Classification .....	25
Prime Farmland and Other Important Farmland .....	25

Erosion Factors .....	27
Windbreaks and Environmental Plantings .....	27
<b>Range</b> .....	83
Range Condition .....	84
Rangeland Management .....	84
Forest Land Understory Vegetation .....	85
<b>Forest Land</b> .....	121
Woodland Ordination System .....	121
Forest Land Management and Productivity .....	122
Forest Land Management and Productivity for Toole County .....	123
<b>Recreation</b> .....	129
<b>Wildlife Habitat</b> .....	153
Elements of Wildlife Habitat .....	153
Kinds of Wildlife Habitat .....	153
Wildlife Habitat in Toole County .....	154
<b>Engineering</b> .....	155
Building Site Development .....	155
Sanitary Facilities .....	156
Waste Management .....	157
Construction Materials .....	158
Water Management .....	159
<b>Soil Properties</b> .....	247
Engineering Index Properties .....	247
Physical and Chemical Properties .....	248
Water Features .....	250
Soil Features .....	251
<b>References</b> .....	377
<b>Glossary</b> .....	379



## Detailed Soil Map Unit Legend

---

- 2A—Riverwash
- 4B—Brockway silt loam, 2 to 4 percent slopes
- 4C—Brockway silt loam, 4 to 8 percent slopes
- 12C—Tally sandy loam, 2 to 8 percent slopes
- 12D—Tally sandy loam, 8 to 15 percent slopes
- 13B—Tanna clay loam, 0 to 4 percent slopes
- 13C—Tanna clay loam, 4 to 8 percent slopes
- 14A—McKenzie silty clay, 0 to 1 percent slopes
- 15F—Lambeth silt loam, 15 to 70 percent slopes
- 16B—Degrand loam, 0 to 4 percent slopes
- 19B—Kenilworth loam, 0 to 4 percent slopes
- 20C—Cabba loam, 4 to 8 percent slopes
- 20D—Cabba loam, 8 to 15 percent slopes
- 22E—Hillon clay loam, 8 to 25 percent slopes
- 22F—Hillon clay loam, 25 to 60 percent slopes
- 23A—Acel silty clay loam, 0 to 2 percent slopes
- 26B—Absher clay, 0 to 4 percent slopes
- 27B—Attewan loam, 0 to 4 percent slopes
- 28A—Nishon clay loam, 0 to 1 percent slopes
- 29B—Nunemaker silty clay loam, 0 to 4 percent slopes
- 29C—Nunemaker silty clay loam, 4 to 8 percent slopes
- 30B—Marvan silty clay, 0 to 4 percent slopes
- 30C—Marvan silty clay, 4 to 8 percent slopes
- 32B—Kobase silty clay loam, 0 to 4 percent slopes
- 32C—Kobase silty clay loam, 4 to 8 percent slopes
- 33B—Phillips clay loam, 0 to 4 percent slopes
- 35B—Assinniboine fine sandy loam, 0 to 4 percent slopes
- 35C—Assinniboine fine sandy loam, 4 to 8 percent slopes
- 36C—Chinook loam, 0 to 8 percent slopes
- 37B—Evanston clay loam, 0 to 4 percent slopes
- 37C—Evanston clay loam, 4 to 8 percent slopes
- 38B—Ethridge clay loam, 0 to 4 percent slopes
- 39B—Ferd loam, 0 to 4 percent slopes
- 42B—Joplin clay loam, 0 to 4 percent slopes
- 42C—Joplin clay loam, 4 to 8 percent slopes
- 44B—Kevin clay loam, 0 to 4 percent slopes
- 44C—Kevin clay loam, 4 to 8 percent slopes
- 45C—Cozberg fine sandy loam, 2 to 8 percent slopes
- 45D—Cozberg fine sandy loam, 8 to 15 percent slopes
- 47B—Marias silty clay, 0 to 4 percent slopes
- 48B—Vanda silty clay, 0 to 4 percent slopes
- 48C—Vanda silty clay, 4 to 8 percent slopes
- 49C—Floweree silt loam, 2 to 8 percent slopes
- 50B—Telstad clay loam, 0 to 4 percent slopes
- 51B—Turner loam, 0 to 4 percent slopes
- 53D—Sunburst clay loam, 8 to 15 percent slopes
- 53E—Sunburst clay loam, 15 to 25 percent slopes
- 53F—Sunburst clay loam, 25 to 70 percent slopes
- 54B—Trudau loam, 0 to 4 percent slopes
- 58B—Lonna silt loam, 0 to 4 percent slopes
- 59B—Hedstrom fine sandy loam, 0 to 4 percent slopes
- 60A—Havre silty clay loam, 0 to 2 percent slopes
- 62A—Vaeda silty clay loam, 0 to 2 percent slopes
- 64B—Nobe clay, 0 to 4 percent slopes
- 67B—Bearpaw clay loam, 0 to 4 percent slopes
- 68B—Gerber clay, 0 to 4 percent slopes
- 69A—Vida clay loam, 0 to 2 percent slopes
- 69C—Vida clay loam, 2 to 8 percent slopes
- 71F—Roy gravelly clay loam, 25 to 60 percent slopes
- 72F—Zahill loam, 25 to 45 percent slopes
- 73D—Yetull loamy fine sand, 0 to 15 percent slopes
- 74B—Shambo loam, 0 to 4 percent slopes
- 75B—Farnuf clay loam, 0 to 3 percent slopes
- 75C—Farnuf clay loam, 3 to 8 percent slopes
- 77C—Tinsley gravelly sandy loam, 2 to 8 percent slopes
- 77E—Tinsley gravelly sandy loam, 8 to 25 percent slopes
- 79B—Yamacall loam, 0 to 4 percent slopes
- 79C—Yamacall loam, 4 to 8 percent slopes
- 79D—Yamacall loam, 8 to 15 percent slopes
- 80B—Williams clay loam, 0 to 3 percent slopes
- 80C—Williams clay loam, 3 to 8 percent slopes
- 82B—Savage silty clay loam, 0 to 3 percent slopes
- 85B—Benz clay loam, 0 to 4 percent slopes
- 88C—Perma gravelly loam, 2 to 8 percent slopes
- 88E—Perma gravelly loam, 8 to 25 percent slopes
- 90A—Harlake silty clay loam, 0 to 2 percent slopes



94C—Busby fine sandy loam, 2 to 8 percent slopes  
 94D—Busby fine sandy loam, 8 to 15 percent slopes  
 96C—Macar loam, 4 to 8 percent slopes  
 96D—Macar loam, 8 to 15 percent slopes  
 98B—Kremlin loam, 0 to 4 percent slopes  
 101A—Hanly-Glendive-Havre complex, 0 to 2 percent slopes  
 110A—Korchea-Kiwanis complex, 0 to 2 percent slopes  
 141A—McKenzie clay, saline, 0 to 2 percent slopes  
 143A—Meadowcreek loam, 0 to 2 percent slopes  
 144A—Bigsandy silty clay loam, 0 to 1 percent slopes  
 162B—Degrand sandy loam, 0 to 4 percent slopes  
 171F—Delpoint-Cabbart clay loams, 25 to 60 percent slopes  
 181D—Doney-Cabba complex, 4 to 15 percent slopes  
 191B—Kenilworth fine sandy loam, 0 to 4 percent slopes  
 200F—Badland  
 201F—Cabba-Rock outcrop complex, 25 to 70 percent slopes  
 202F—Cabba-Dast fine sandy loams, 25 to 45 percent slopes  
 203E—Cabba-Doney clay loams, 8 to 25 percent slopes  
 211F—Cabbart-Rock outcrop complex, 25 to 70 percent slopes  
 212F—Cabbart-Hillon complex, 25 to 45 percent slopes  
 213E—Cabbart-Delpoint loams, 8 to 25 percent slopes  
 221E—Hillon-Kevin clay loams, 15 to 25 percent slopes  
 222E—Hillon-Neldore complex, 8 to 25 percent slopes  
 222F—Hillon-Neldore complex, 25 to 70 percent slopes  
 224E—Hillon-Joplin loams, 8 to 25 percent slopes

241C—Marmarth-Evanston loams, 0 to 8 percent slopes  
 251C—Bascovy clay loam, 2 to 8 percent slopes  
 252D—Bascovy-Neldore clays, 8 to 15 percent slopes  
 261A—Absher-Nobe complex, 0 to 2 percent slopes  
 272B—Attewan sandy loam, 0 to 4 percent slopes  
 300F—Rubble land  
 311B—Creed-Gerdrum-Absher complex, 0 to 4 percent slopes  
 321B—Kobase silty clay loam, calcareous, 0 to 4 percent slopes  
 321C—Kobase silty clay loam, calcareous, 4 to 8 percent slopes  
 323C—Sagedale silty clay loam, 2 to 8 percent slopes  
 331B—Phillips-Elloam clay loams, 0 to 4 percent slopes  
 332B—Phillips-Kevin clay loams, 0 to 4 percent slopes  
 364C—Chinook fine sandy loam, 0 to 8 percent slopes  
 372B—Evanston fine sandy loam, 0 to 4 percent slopes  
 373C—Evanston-Tinsley complex, 2 to 8 percent slopes  
 374B—Evanston loam, 0 to 4 percent slopes  
 374C—Evanston loam, 4 to 8 percent slopes  
 378B—Evanston complex, 0 to 4 percent slopes  
 379C—Evanston-Busby complex, 2 to 8 percent slopes  
 384B—Ethridge silty clay loam, 0 to 4 percent slopes  
 386B—Ethridge-Evanston clay loams, 0 to 4 percent slopes  
 391B—Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes  
 391C—Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes

- 
- 402A—Gerdrum-Absher complex, 0 to 2 percent slopes
- 411B—Reeder-Cabba complex, 0 to 4 percent slopes
- 411C—Reeder-Cabba complex, 4 to 8 percent slopes
- 421C—Joplin-Hillon clay loams, 2 to 8 percent slopes
- 421D—Joplin-Hillon clay loams, 8 to 15 percent slopes
- 423B—Joplin-Hillon clay loams, 0 to 3 percent slopes
- 423C—Hillon-Joplin clay loams, 3 to 8 percent slopes
- 424C—Joplin-Hillon gravelly loams, 3 to 8 percent slopes
- 425C—Joplin-Telstad clay loams, 2 to 8 percent slopes
- 426B—Joplin loam, 0 to 4 percent slopes
- 427B—Joplin complex, 0 to 4 percent slopes
- 427C—Joplin complex, 4 to 8 percent slopes
- 441C—Kevin-Hillon clay loams, 2 to 8 percent slopes
- 443B—Kevin-Ferd complex, 0 to 4 percent slopes
- 444B—Kevin, calcareous-Ferd complex, 0 to 4 percent slopes
- 445B—Kevin complex, 0 to 4 percent slopes
- 445C—Kevin complex, 4 to 8 percent slopes
- 446C—Kevin-Elloam clay loams, 2 to 8 percent slopes
- 451A—Cozberg-Lihen fine sandy loams, 0 to 2 percent slopes
- 451C—Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes
- 481A—Bigsag silty clay, 0 to 2 percent slopes
- 482A—Vanda-Marvan, saline, clays, 0 to 2 percent slopes
- 503B—Telstad-Joplin clay loams, 0 to 4 percent slopes
- 503C—Telstad-Joplin clay loams, 4 to 8 percent slopes
- 504B—Telstad-Joplin loams, 0 to 4 percent slopes
- 504C—Telstad-Joplin loams, 4 to 8 percent slopes
- 511C—Turner sandy loam, 2 to 6 percent slopes
- 521B—Elloam-Absher clay loams, 0 to 4 percent slopes
- 551E—Lihen-Blanchard loamy sands, 8 to 25 percent slopes
- 561B—Scobey-Kevin clay loams, 0 to 4 percent slopes
- 561C—Scobey-Kevin clay loams, 4 to 8 percent slopes
- 561D—Scobey-Kevin clay loams, 8 to 15 percent slopes
- 563B—Scobey clay loam, 0 to 4 percent slopes
- 571A—Ryell-Rivra complex, 0 to 2 percent slopes
- 572A—Ryell-Havre loams, 0 to 2 percent slopes
- 581B—Lonna silty clay loam, 0 to 4 percent slopes
- 581C—Lonna silty clay loam, 4 to 8 percent slopes
- 582B—Lonna-Ethridge complex, 0 to 4 percent slopes
- 601A—Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded
- 603A—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded
- 651E—Fleak-Lihen fine sandy loams, 8 to 25 percent slopes
- 673B—Bearpaw-Daglum clay loams, 0 to 4 percent slopes
- 691B—Vida-Vida, calcareous-Williams clay loams, 0 to 3 percent slopes
- 691C—Vida-Vida, calcareous-Williams clay loams, 3 to 8 percent slopes
- 692D—Vida, calcareous-Williams-Zahill clay loams, 4 to 15 percent slopes
- 694C—Vida-Williams clay loams, 3 to 8 percent slopes
- 695D—Vida-Williams-Zahill clay loams, 4 to 15 percent slopes

---

696E—Vida-Zahill clay loams, 8 to 25 percent slopes  
 697C—Vida-Bearpaw clay loams, 2 to 8 percent slopes  
 698D—Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes  
 698E—Vida-Zahill-Nishon clay loams, 0 to 25 percent slopes  
 721E—Zahill-Zahl complex, 15 to 25 percent slopes  
 721F—Zahill-Zahl complex, 25 to 60 percent slopes  
 722F—Zahill-Dast-Cabba complex, 25 to 65 percent slopes  
 743A—Shambo-Fairway loams, 0 to 2 percent slopes  
 761B—Fairway-Bigsandy loams, 0 to 4 percent slopes  
 793B—Yamacall loam, calcareous, 0 to 4 percent slopes  
 793C—Yamacall loam, calcareous, 4 to 8 percent slopes  
 793D—Yamacall loam, calcareous, 8 to 15 percent slopes

831B—Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes  
 861F—Stemple, high elevation-Rubble land complex, 25 to 70 percent slopes  
 862F—Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes  
 871B—Nesda complex, 0 to 4 percent slopes  
 881E—Perma-Whitlash cobbly loams, 8 to 25 percent slopes  
 881F—Perma-Whitlash cobbly loams, 25 to 70 percent slopes  
 942C—Busby-Chinook fine sandy loams, 2 to 8 percent slopes  
 961B—Macar clay loam, 0 to 4 percent slopes  
 971C—Neldore-Bascovy clays, 2 to 8 percent slopes  
 971F—Neldore-Bascovy clays, 8 to 45 percent slopes  
 972F—Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes  
 DA—Denied access  
 M-W—Miscellaneous water  
 W—Water

# Summary of Tables

---

## **Part I** (For page numbers, see "Summary of Tables" in Part I)

Temperature and precipitation

Freeze dates in spring and fall

Growing season

Classification of the soils

Acreage and proportionate extent of the soils

## **Part II**

Classification of the soils -----	14
Acreage and proportionate extent of the soils -----	16
Main cropland limitations and hazards -----	29
Land capability and yields per acre of crops and pasture -----	56
Prime farmland -----	70
Windbreaks suitability groups -----	71
Windbreak suitability group species list -----	80
Rangeland productivity and characteristic plant communities -----	86
Woodland understory vegetation -----	119
Forest land management -----	126
Forest land productivity -----	126
Main forest access road limitations and hazards -----	127
Recreational development -----	131

---

Building site development-----	161
Sanitary facilities -----	184
Construction materials -----	203
Water management -----	225
Engineering index properties-----	252
Physical properties of the soils -----	299
Chemical properties of the soils -----	324
Water features -----	348
Soil features -----	362



# Soil Survey of Toole County, Montana

---

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

## Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Absher-----	Fine, montmorillonitic Typic Natriboralfs
*Acel-----	Fine, montmorillonitic Mollic Eutroboralfs
Assinniboine-----	Fine-loamy, mixed Aridic Argiborolls
Attewan-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Bascovy-----	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Bearpaw-----	Fine, montmorillonitic Typic Argiborolls
Benz-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Bigsag-----	Fine, montmorillonitic (calcareous), frigid Typic Halaquepts
Bigsandy-----	Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents
Blanchard-----	Mixed, frigid Typic Ustipsamments
Brockway-----	Fine silty, mixed, frigid Calcicorthidic Ustochrepts
Busby-----	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Cabba-----	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart-----	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Chinook-----	Coarse-loamy, mixed Aridic Haploborolls
Cozberg-----	Coarse-loamy, mixed Aridic Haploborolls
Creed-----	Fine, montmorillonitic Typic Natriboralfs
Daglum-----	Fine, montmorillonitic Vertic Natriborolls
Dast-----	Coarse-loamy, mixed, frigid Typic Ustochrepts
Degrand-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Delpoint-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Doney-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Elloam-----	Fine, montmorillonitic Typic Natriboralfs
Enbar-----	Fine-loamy, mixed Cumulic Haploborolls
Ethridge-----	Fine, montmorillonitic Aridic Argiborolls
Evanston-----	Fine-loamy, mixed Aridic Argiborolls
Evanston, calcareous----	Fine-loamy, mixed Aridic Argiborolls
Fairway-----	Fine-loamy, mixed Fluvaquentic Haploborolls
Farnuf-----	Fine-loamy, mixed Typic Argiborolls
Ferd-----	Fine, montmorillonitic Glossic Eutroboralfs
Fleak-----	Mixed, frigid, shallow Aridic Ustipsamments
Floweree-----	Fine-silty, mixed Aridic Haploborolls
Gerber-----	Fine, montmorillonitic Vertic Argiborolls
Gerdrum-----	Fine, montmorillonitic Typic Natriboralfs
Glendive-----	Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hanly-----	Sandy, mixed, frigid Aridic Ustifluvents
Harlake-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Havre-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hedstrom-----	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Hillon-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Joplin-----	Fine-loamy, mixed Aridic Argiborolls
Joplin, calcareous-----	Fine-loamy, mixed Aridic Argiborolls
Kenilworth-----	Fine-loamy, mixed Aridic Argiborolls
Kevin-----	Fine-loamy, mixed Aridic Argiborolls
Kevin, calcareous-----	Fine-loamy, mixed Aridic Argiborolls
Kiwanis-----	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Typic Ustifluvents
Kobase-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Korchea-----	Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents
Kremlin-----	Fine-loamy, mixed Aridic Haploborolls
Lambeth-----	Fine-silty, mixed (calcareous), frigid Aridic Ustorthents
Lihen-----	Sandy, mixed Entic Haploborolls
Lonna-----	Fine-silty, mixed, frigid Aridic Ustochrepts



## Classification of the Soils--continued

Soil name	Family or higher taxonomic class
Macar-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Marias-----	Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Marmarth-----	Fine-loamy, mixed Aridic Argiborolls
Marvan-----	Fine, montmorillonitic, frigid Sodic Haplusterts
Mckenzie-----	Fine, montmorillonitic, frigid Chromic Endoaquerts
Meadowcreek-----	Fine-loamy over sandy or sandy-skeletal, mixed Fluvaquentic Haploborolls
Neldore-----	Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents
Nesda-----	Sandy-skeletal, mixed Fluventic Haploborolls
Nesda, cool-----	Sandy-skeletal, mixed Fluventic Haploborolls
Nishon-----	Fine, montmorillonitic, frigid Typic Albaqualfs
Nobe-----	Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents
Nunemaker-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Perma-----	Loamy-skeletal, mixed Typic Haploborolls
Phillips-----	Fine, montmorillonitic Typic Eutroboralfs
Reeder-----	Fine-loamy, mixed Typic Argiborolls
Rivra-----	Sandy-skeletal, mixed, frigid Aridic Ustifluvents
Roy-----	Clayey-skeletal, mixed Typic Argiborolls
Ryell-----	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Aridic Ustifluvents
Sagedale-----	Fine, montmorillonitic, frigid Typic Ustochrepts
Savage-----	Fine, montmorillonitic Typic Argiborolls
Scobey-----	Fine, montmorillonitic Aridic Argiborolls
Scobey, calcareous-----	Fine, montmorillonitic Aridic Argiborolls
Shambo-----	Fine-loamy, mixed Typic Haploborolls
Stemple-----	Loamy-skeletal, mixed Typic Paleboralfs
Sunburst-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Tally-----	Coarse-loamy, mixed Typic Haploborolls
Tanna-----	Fine, montmorillonitic Aridic Argiborolls
Telstad-----	Fine-loamy, mixed Aridic Argiborolls
Tinsley-----	Sandy-skeletal, mixed, frigid Typic Ustorthents
Trudau-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Turner-----	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Vaeda-----	Fine, montmorillonitic, nonacid, frigid Aridic Ustorthents
Vanda-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Vida-----	Fine-loamy, mixed Typic Argiborolls
Vida, calcareous-----	Fine-loamy, mixed Typic Argiborolls
Whitlash-----	Loamy-skeletal, mixed Lithic Haploborolls
Williams-----	Fine-loamy, mixed Typic Argiborolls
Yamacall-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Yetull-----	Mixed, frigid Typic Ustipsamments
Zahill-----	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents
Zahl-----	Fine-loamy, mixed Typic Calciborolls

## Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
2A	Riverwash-----	213	*
4B	Brockway silt loam, 2 to 4 percent slopes-----	325	*
4C	Brockway silt loam, 4 to 8 percent slopes-----	279	*
12C	Tally sandy loam, 2 to 8 percent slopes-----	835	*
12D	Tally sandy loam, 8 to 15 percent slopes-----	219	*
13B	Tanna clay loam, 0 to 4 percent slopes-----	2,768	0.2
13C	Tanna clay loam, 4 to 8 percent slopes-----	579	*
14A	McKenzie silty clay, 0 to 1 percent slope-----	3,068	0.2
15F	Lambeth silt loam, 15 to 70 percent slopes-----	4,962	0.4
16B	Degradand loam, 0 to 4 percent slopes-----	4,219	0.3
19B	Kenilworth loam, 0 to 4 percent slopes-----	3,531	0.3
20C	Cabba loam, 4 to 8 percent slopes-----	704	*
20D	Cabba loam, 8 to 15 percent slopes-----	255	*
22E	Hillon clay loam, 8 to 25 percent slopes-----	3,024	0.2
22F	Hillon clay loam, 25 to 60 percent slopes-----	12,336	1.0
23A	Acel silty clay loam, 0 to 2 percent slopes-----	3,842	0.3
26B	Absher clay, 0 to 4 percent slopes-----	1,675	0.1
27B	Attewan loam, 0 to 4 percent slopes-----	1,883	0.2
28A	Nishon clay loam, 0 to 1 percent slope-----	7,517	0.6
29B	Nunemaker silty clay loam, 0 to 4 percent slopes-----	14,623	1.2
29C	Nunemaker silty clay loam, 4 to 8 percent slopes-----	2,667	0.2
30B	Marvan silty clay, 0 to 4 percent slopes-----	6,079	0.5
30C	Marvan silty clay, 4 to 8 percent slopes-----	698	*
32B	Kobase silty clay loam, 0 to 4 percent slopes-----	5,090	0.4
32C	Kobase silty clay loam, 4 to 8 percent slopes-----	1,644	0.1
33B	Phillips clay loam, 0 to 4 percent slopes-----	4,728	0.4
35B	Assinniboine fine sandy loam, 0 to 4 percent slopes-----	4,167	0.3
35C	Assinniboine fine sandy loam, 4 to 8 percent slopes-----	484	*
36C	Chinook loam, 0 to 8 percent slopes-----	1,212	*
37B	Evanston clay loam, 0 to 4 percent slopes-----	39,616	3.2
37C	Evanston clay loam, 4 to 8 percent slopes-----	1,452	0.1
38B	Ethridge clay loam, 0 to 4 percent slopes-----	10,520	0.8
39B	Ferd loam, 0 to 4 percent slopes-----	10,375	0.8
42B	Joplin clay loam, 0 to 4 percent slopes-----	50,034	4.0
42C	Joplin clay loam, 4 to 8 percent slopes-----	4,716	0.4
44B	Kevin clay loam, 0 to 4 percent slopes-----	30,989	2.5
44C	Kevin clay loam, 4 to 8 percent slopes-----	3,286	0.3
45C	Cozberg fine sandy loam, 2 to 8 percent slopes-----	1,654	0.1
45D	Cozberg fine sandy loam, 8 to 15 percent slopes-----	446	*
47B	Maxias silty clay, 0 to 4 percent slopes-----	10,711	0.9
48B	Vanda silty clay, 0 to 4 percent slopes-----	7,033	0.6
48C	Vanda silty clay, 4 to 8 percent slopes-----	374	*
49C	Flowerree silt loam, 2 to 8 percent slopes-----	228	*
50B	Telstad clay loam, 0 to 4 percent slopes-----	2,849	0.2
51B	Turner loam, 0 to 4 percent slopes-----	1,739	0.1
53D	Sunburst clay loam, 8 to 15 percent slopes-----	281	*
53E	Sunburst clay loam, 15 to 25 percent slopes-----	3,720	0.3
53F	Sunburst clay loam, 25 to 70 percent slopes-----	2,637	0.2
54B	Trudau loam, 0 to 4 percent slopes-----	9,883	0.8
58B	Lonna silt loam, 0 to 4 percent slopes-----	2,345	0.2
59B	Hedstrom fine sandy loam, 0 to 4 percent slopes-----	413	*
60A	Havre silty clay loam, 0 to 2 percent slopes-----	821	*
62A	Vaeda silty clay loam, 0 to 2 percent slopes-----	4,226	0.3
64B	Nobe clay, 0 to 4 percent slopes-----	2,359	0.2
67B	Bearpaw clay loam, 0 to 4 percent slopes-----	1,308	0.1
68B	Gerber clay, 0 to 4 percent slopes-----	374	*
69A	Vida clay loam, 0 to 2 percent slopes-----	1,120	*
69C	Vida clay loam, 2 to 8 percent slopes-----	1,970	0.2
71F	Roy gravelly clay loam, 25 to 60 percent slopes-----	96	*
72F	Zahill loam, 25 to 45 percent slopes-----	3,603	0.3
73D	Yetull loamy fine sand, 0 to 15 percent slopes-----	2,575	0.2
74B	Shambo loam, 0 to 4 percent slopes-----	2,338	0.2

## Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
75B	Farnuf clay loam, 0 to 3 percent slopes-----	8,045	0.6
75C	Farnuf clay loam, 3 to 8 percent slopes-----	1,945	0.2
77C	Tinsley gravelly sandy loam, 2 to 8 percent slopes-----	1,650	0.1
77E	Tinsley gravelly sandy loam, 8 to 25 percent slopes-----	575	*
79B	Yamacall loam, 0 to 4 percent slopes-----	3,424	0.3
79C	Yamacall loam, 4 to 8 percent slopes-----	1,692	0.1
79D	Yamacall loam, 8 to 15 percent slopes-----	1,507	0.1
80B	Williams clay loam, 0 to 3 percent slopes-----	4,059	0.3
80C	Williams clay loam, 3 to 8 percent slopes-----	2,350	0.2
82B	Savage silty clay loam, 0 to 3 percent slopes-----	3,357	0.3
85B	Benz clay loam, 0 to 4 percent slopes-----	770	*
88C	Perma gravelly loam, 2 to 8 percent slopes-----	2,196	0.2
88E	Perma gravelly loam, 8 to 25 percent slopes-----	1,008	*
90A	Harlake silty clay loam, 0 to 2 percent slopes-----	346	*
94C	Busby fine sandy loam, 2 to 8 percent slopes-----	4,313	0.3
94D	Busby fine sandy loam, 8 to 15 percent slopes-----	323	*
96C	Macar loam, 4 to 8 percent slopes-----	747	*
96D	Macar loam, 8 to 15 percent slopes-----	554	*
98B	Kremlin loam, 0 to 4 percent slopes-----	2,144	0.2
101A	Hanly-Glendive-Havre complex, 0 to 2 percent slopes-----	730	*
110A	Korchea-Kiwanis complex, 0 to 2 percent slopes-----	189	*
141A	McKenzie clay, saline, 0 to 2 percent slopes-----	1,874	0.2
143A	Meadowcreek loam, 0 to 2 percent slopes-----	167	*
144A	Bigsandy silty clay loam, 0 to 1 percent slope-----	690	*
162B	Degradand sandy loam, 0 to 4 percent slopes-----	767	*
171F	Delpoint-Cabbart clay loams, 25 to 60 percent slopes-----	600	*
181D	Doney-Cabba complex, 4 to 15 percent slopes-----	385	*
191B	Kenilworth fine sandy loam, 0 to 4 percent slopes-----	5,737	0.5
200F	Badland-----	83	*
201F	Cabba-Rock outcrop complex, 25 to 70 percent slopes-----	2,463	0.2
202F	Cabba-Dast fine sandy loams, 25 to 45 percent slopes-----	2,233	0.2
203E	Cabba-Doney clay loams, 8 to 25 percent slopes-----	1,096	*
211F	Cabbart-Rock outcrop complex, 25 to 70 percent slopes-----	2,890	0.2
212F	Cabbart-Hillon complex, 25 to 45 percent slopes-----	1,915	0.2
213E	Cabbart-Delpoint loams, 8 to 25 percent slopes-----	718	*
221E	Hillon-Kevin clay loams, 15 to 25 percent slopes-----	1,163	*
222E	Hillon-Neldore complex, 8 to 25 percent slopes-----	8,917	0.7
222F	Hillon-Neldore complex, 25 to 70 percent slopes-----	19,338	1.6
224E	Hillon-Joplin loams, 8 to 25 percent slopes-----	11,218	0.9
241C	Marmarth-Evanston loams, 0 to 8 percent slopes-----	1,746	0.1
251C	Bascovy clay loam, 2 to 8 percent slopes-----	2,541	0.2
252D	Bascovy-Neldore clays, 8 to 15 percent slopes-----	885	*
261A	Absher-Nobe complex, 0 to 2 percent slopes-----	4,104	0.3
272B	Attewan sandy loam, 0 to 4 percent slopes-----	260	*
300F	Rubble land-----	1,702	0.1
311B	Creed-Gerdrum-Absher complex, 0 to 4 percent slopes-----	19,930	1.6
321B	Kobase silty clay loam, calcareous, 0 to 4 percent slopes-----	7,707	0.6
321C	Kobase silty clay loam, calcareous, 4 to 8 percent slopes-----	3,489	0.3
323C	Sagedale silty clay loam, 2 to 8 percent slopes-----	678	*
331B	Phillips-Elloam clay loams, 0 to 4 percent slopes-----	15,229	1.2
332B	Phillips-Kevin clay loams, 0 to 4 percent slopes-----	38,445	3.1
364C	Chinook fine sandy loam, 0 to 8 percent slopes-----	13,887	1.1
372B	Evanston fine sandy loam, 0 to 4 percent slopes-----	2,086	0.2
373C	Evanston-Tinsley complex, 2 to 8 percent slopes-----	289	*
374B	Evanston loam, 0 to 4 percent slopes-----	992	*
374C	Evanston loam, 4 to 8 percent slopes-----	585	*
378B	Evanston complex, 0 to 4 percent slopes-----	7,328	0.6
379C	Evanston-Busby complex, 2 to 8 percent slopes-----	896	*
384B	Ethridge silty clay loam, 0 to 4 percent slopes-----	3,717	0.3
386B	Ethridge-Evanston clay loams, 0 to 4 percent slopes-----	3,229	0.2
391B	Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes-----	9,323	0.7
391C	Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes-----	539	*

\*See footnote at end of table

## Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
402A	Gerdrum-Absher complex, 0 to 2 percent slopes-----	15,281	1.2
411B	Reeder-Cabba complex, 0 to 4 percent slopes-----	1,280	0.1
411C	Reeder-Cabba complex, 4 to 8 percent slopes-----	2,166	0.2
421C	Joplin-Millon clay loams, 2 to 8 percent slopes-----	41,552	3.3
421D	Joplin-Millon clay loams, 8 to 15 percent slopes-----	23,838	1.9
423B	Joplin-Millon clay loams, 0 to 3 percent slopes-----	24,630	2.0
423C	Millon-Joplin clay loams, 3 to 8 percent slopes-----	37,658	3.0
424C	Joplin-Millon gravelly loams, 3 to 8 percent slopes-----	3,750	0.3
425C	Joplin-Telstad clay loams, 2 to 8 percent slopes-----	1,287	0.1
426B	Joplin loam, 0 to 4 percent slopes-----	2,471	0.2
427B	Joplin complex, 0 to 4 percent slopes-----	74,784	6.0
427C	Joplin complex, 4 to 8 percent slopes-----	12,791	1.0
441C	Kevin-Millon clay loams, 2 to 8 percent slopes-----	9,050	0.7
443B	Kevin-Ferd complex, 0 to 4 percent slopes-----	24,067	1.9
444B	Kevin, calcareous-Ferd complex, 0 to 4 percent slopes-----	1,675	0.1
445B	Kevin complex, 0 to 4 percent slopes-----	17,008	1.4
445C	Kevin complex, 4 to 8 percent slopes-----	4,911	0.4
446C	Kevin-Elloam clay loams, 2 to 8 percent slopes-----	2,103	0.2
451A	Cozberg-Lihen fine sandy loams, 0 to 2 percent slopes-----	810	*
451C	Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes-----	2,334	0.2
481A	Bigsag silty clay, 0 to 2 percent slopes-----	1,563	0.1
482A	Vanda-Marvan, saline, clays, 0 to 2 percent slopes-----	2,703	0.2
503B	Telstad-Joplin clay loams, 0 to 4 percent slopes-----	31,855	2.6
503C	Telstad-Joplin clay loams, 4 to 8 percent slopes-----	5,896	0.5
504B	Telstad-Joplin loams, 0 to 4 percent slopes-----	14,277	1.1
504C	Telstad-Joplin loams, 4 to 8 percent slopes-----	2,283	0.2
511C	Turner sandy loam, 2 to 6 percent slopes-----	685	*
521B	Elloam-Absher clay loams, 0 to 4 percent slopes-----	3,730	0.3
551E	Lihen-Blanchard loamy sands, 8 to 25 percent slopes-----	858	*
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes-----	40,655	3.3
561C	Scobey-Kevin clay loams, 4 to 8 percent slopes-----	2,511	0.2
561D	Scobey-Kevin clay loams, 8 to 15 percent slopes-----	996	*
563B	Scobey clay loam, 0 to 4 percent slopes-----	143	*
571A	Ryell-Rivra complex, 0 to 2 percent slopes-----	489	*
572A	Ryell-Havre loams, 0 to 2 percent slopes-----	45	*
581B	Lonna silty clay loam, 0 to 4 percent slopes-----	7,116	0.6
581C	Lonna silty clay loam, 4 to 8 percent slopes-----	1,054	*
582B	Lonna-Ethridge complex, 0 to 4 percent slopes-----	3,105	0.2
601A	Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded-----	7,381	0.6
603A	Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded-----	4,864	0.4
651E	Fleak-Lihen fine sandy loams, 8 to 25 percent slopes-----	207	*
673B	Bearpaw-Daglum clay loams, 0 to 4 percent slopes-----	2,127	0.2
691B	Vida-Vida, calcareous-Williams clay loams, 0 to 3 percent slopes-----	6,457	0.5
691C	Vida-Vida, calcareous-Williams clay loams, 3 to 8 percent slopes-----	24,572	2.0
692D	Vida, calcareous-Williams-Zahill clay loams, 4 to 15 percent slopes-----	14,386	1.2
694C	Vida-Williams clay loams, 3 to 8 percent slopes-----	28,592	2.3
695D	Vida-Williams-Zahill clay loams, 4 to 15 percent slopes-----	31,558	2.5
696E	Vida-Zahill clay loams, 8 to 25 percent slopes-----	15,921	1.3
697C	Vida-Bearpaw clay loams, 2 to 8 percent slopes-----	14,631	1.2
698D	Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes-----	5,994	0.5
698E	Vida-Zahill-Nishon clay loams, 0 to 25 percent slopes-----	458	*
721E	Zahill-Zahl complex, 15 to 25 percent slopes-----	5,695	0.4
721F	Zahill-Zahl complex, 25 to 60 percent slopes-----	15,749	1.3
722F	Zahill-Dast-Cabba complex, 25 to 65 percent slopes-----	848	*
743A	Shambo-Fairway loams, 0 to 2 percent slopes-----	2,019	0.2
761B	Fairway-Bigsandy loams, 0 to 4 percent slopes-----	1,687	0.1
793B	Yamacall loam, calcareous, 0 to 4 percent slopes-----	3,138	0.2
793C	Yamacall loam, calcareous, 4 to 8 percent slopes-----	3,958	0.3
793D	Yamacall loam, calcareous, 8 to 15 percent slopes-----	1,738	0.1
831B	Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes-----	205	*
861F	Stemple, high elevation-Rubble land complex, 25 to 70 percent slopes-----	1,167	*
862F	Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes-----	2,363	0.2

## Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
871B	Nesda complex, 0 to 4 percent slopes-----	227	*
881E	Perma-Whitlash cobbly loams, 8 to 25 percent slopes-----	1,500	0.1
881F	Perma-Whitlash cobbly loams, 25 to 70 percent slopes-----	11,072	0.9
942C	Busby-Chinook fine sandy loams, 2 to 8 percent slopes-----	1,768	0.1
961B	Macar clay loam, 0 to 4 percent slopes-----	238	*
971C	Neldore-Bascovy clays, 2 to 8 percent slopes-----	5,994	0.5
971F	Neldore-Bascovy clays, 8 to 45 percent slopes-----	7,266	0.6
972F	Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes-----	20,591	1.6
DA	Denied access-----	4,594	0.4
M-W	Miscellaneous water-----	30	*
W	Water-----	17,491	1.4
	Total-----	1,245,400	100.0

\* Less than 0.1 percent.



# Agronomy

---

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

## Cropland Limitations and Hazards

The management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in the table "Main Cropland Limitations and Hazards." The main concerns in managing nonirrigated cropland are conserving moisture, controlling soil blowing and water erosion, and maintaining soil fertility.

*Conserving moisture* consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *soil blowing* and *water erosion*. Conservation tillage, stripcropping, field windbreaks, tall grass barriers, contour farming, conservation cropping systems, crop residue management, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the limitations and hazards shown in the table cannot be easily overcome. These are *channels*, *flooding*, *depth to rock*, *ponding*, *gullies*, and *lack of timely precipitation*.

Additional limitations and hazards are as follows:

*Areas of rock outcrop and slick spots.*—Farming around these areas may be feasible. Subsoiling or deep ripping soft sedimentary beds increases the effective rooting depth and the rate of water infiltration.

*Excessive permeability.*—This limitation causes deep leaching of nutrients and pesticides. The capacity of the soil to retain moisture for plant use is poor.

*Potential for ground-water pollution.*—This is a hazard in soils with excessive permeability, hard bedrock, or a water table within the profile.

*Lime content, limited available water capacity, poor tilth, restricted permeability, and surface crusting.*—These limitations can be overcome by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

*Short frost-free season.*—If the growing season is less than 90 days, short-season crops or grasses should be grown.

*Surface rock fragments.*—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

*Slope.*—Where the slope is more than 8 percent, water erosion and soil blowing may be accelerated unless conservation farming practices are applied.

*Surface stones.*—Stones or boulders on the surface can hinder normal tillage unless they are removed.

*Salt and sodium content.*—In areas where this is a limitation, only salt- and sodium-tolerant crops should be grown.

On irrigated soils the main management concerns are *efficient water use*, *nutrient management*, *control of erosion*, *pest and weed control*, and *timely planting and harvesting* for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation

wastes water, leaches plant nutrients, and causes erosion. Also, it can create drainage problems, raise the water table, and increase soil salinity.

Following is an explanation of the criteria used to determine the limitations or hazards.

*Areas of rock outcrop.*—Rock outcrop is a named component of the map unit.

*Areas of rubble land.*—Rubble land is a named component of the map unit.

*Areas of slick spots.*—Slick spots are a named component of the map unit.

*Channeled.*—The word “channeled” is included in the name of the map unit.

*Depth to rock.*—Bedrock is within a depth of 40 inches.

*Water erosion.*—The surface K factor multiplied by the upper slope limit is more than 2 (same as prime farmland criteria).

*Excessive permeability.*—The upper limit of the permeability range is 6 inches or more within the soil profile.

*Flooding.*—The component of the map unit is occasionally flooded or frequently flooded.

*Gullied.*—The word “gullied” is included in the name of the map unit.

*Lack of timely precipitation.*—The component of the map unit has a Xeric moisture regime. The amount of annual precipitation is no more than 14 inches.

*Lime content.*—The component is assigned to wind erodibility group 4L or has more than 5 percent lime in the upper 10 inches.

*Limited available water capacity.*—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 5 inches or less.

*Ponding.*—Ponding duration is assigned to the component of the map unit.

*Potential for ground-water pollution.*—The soil has a water table within a depth of 4 feet or hard bedrock within the profile, or permeability is more than 6 inches per hour within the soil.

*Poor tilth.*—The component of the map unit has more than 35 percent clay in the surface layer.

*Restricted permeability.*—Permeability is 0.06 inch per hour or less within the soil profile.

*Salt content.*—The component of the map unit has an electrical conductivity of more than 4 in the surface layer or more than 8 within a depth of 30 inches.

*Short frost-free season.*—The map unit has a growing season of less than 90 frost-free days.

*Slope.*—The upper slope range of the component of the map unit is more than 8 percent.

*Sodium content.*—The sodium adsorption ratio of the component of the map unit is more than 13 within a depth of 30 inches.

*Soil blowing.*—The wind erodibility index multiplied by the selected high C factor for the survey area and then divided by the T factor is more than 8 for the component of the map unit.

*Surface rock fragments.*—The terms describing the texture of the surface layer include any rock fragment modifier except for gravelly or channery, and “surface stones” is not already indicated as a limitation.

*Surface crusting.*—The sodium adsorption ratio in the surface layer is 5 or more for any texture and 4 or more if the texture is silt, silt loam, loam, or very fine sandy loam.

*Surface stones.*—The terms describing the texture of the surface layer include any stony or bouldery modifier, or the soil is a stony or bouldery phase.

*Water table.*—The component of the map unit has a water table within a depth of 60 inches.

## Crop Yield Estimates

The average yields per acre that can be expected of the principal crops are shown in the table “Land Capability and Yields per Acre of Crops and Pasture.” In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The non-irrigated small grain yields presented are a maximum potential estimated using a crop yield model based on Montana Agricultural Experiment Station Special Report number 35. Basic model assumptions include soil moisture at field capacity to 40 inches, a 70 percent annual precipitation probability as published by the National Climatic Center, fertilization to yield, and full pest and weed control. Irrigated small grain yields are not provided. The model has been validated with collected yield data.

Forage crop yields are estimated based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure,



and green manure crops; and harvesting that ensures the smallest possible loss.

For provided irrigated yields, it is assumed that the irrigation system is adapted to the soils and to the forage crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

### **Pasture and Hayland Management**

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often provided in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields other than those shown in the table "Land Capability and Yields per Acre of Crops and Pasture."

### **Crops and Pasture of Toole County**

About 56 percent of this county is cropland. There are about 700,000 acres of dryland farming and 2,500 acres of irrigated land.

The main dryland crops are barley and wheat. Spring wheat is the predominant wheat crop; however, some winter wheat is seeded each year. Other crops seeded include malting barley, alfalfa hay, grass for hay and pasture, durum wheat, triticale, and oats.

The main considerations in managing nonirrigated cropland are conserving moisture, reducing soil blowing and water erosion, and controlling soil salinity. Each is explained in the following paragraphs.

*Conserving soil moisture.* Most of the survey area does not receive enough annual precipitation to produce a profitable crop every year. A small grain-fallow rotation is commonly used to assure a successful crop. In this rotation, the soil moisture accumulated after harvest of the previous crop and during the fallow period is critical to the yield of the next crop. Each additional inch of stored soil moisture helps to produce an estimated 4 to 5 bushels of wheat or 5 to 7 bushels of barley.

Soils with a limited available water capacity are not capable of storing all of the moisture received from snow and rainfall before the next crop in a small grain-fallow system. Sandy soils and shallow depth to bedrock soils are in this category. Water is lost by deep percolation below the crop root zone, or is lost by runoff where the infiltration rate of precipitation is too slow. These soils are sometimes cropped every year, since accumulated moisture from summer fallow is lost to the crop.

Management practices that help conserve moisture include good weed control, leaving the stubble stand over the first winter after harvest, reducing tillage operations, leaving 30 percent or more of the residue on the surface during the fallow year, and planting moisture-efficient crops and varieties. Barley is generally more efficient than spring wheat, and semi-dwarf varieties of spring wheat are generally more efficient than tall varieties in terms of their ability to convert soil moisture into bushels of grain.

Where enough soil moisture is accumulated after harvest and over the winter, recropping may be more profitable than the traditional crop-fallow system. Though the science is not exact, 2 feet of moist soil, determined by probing in medium to heavy textured soils, is considered enough to produce an adequate crop in most years. This is equal to between 3.5 and 4.5 inches of stored soil moisture. Growing season precipitation is expected to be normal or near normal for a successful crop. Additional fertilizer is needed to recrop, since most of the nutrients normally released from the crop residue breakdown in a crop-fallow system are still contained in the residue.

*Reducing soil blowing.* Soil blowing is a problem on most cultivated soils in a crop-fallow rotation. Most soil blowing takes place after the fallow season from November through May. It is a special problem early in the spring when there are persistent strong winds. Unless they are well managed, sands and clays are readily eroded during this period. Loamy soils can also erode if they are cultivated in wide strips or in blocks during dry periods when the wind velocity is high.

Loss of the surface layer through soil blowing affects soil productivity, soil tilth, available water-

holding capacity, rooting depth, depth to lime, and the sediment load in streams. In addition it often affects crop yields indirectly by removing or displacing chemical fertilizers and pesticides. It can also contribute to chemical pollution of surface waters.

Some of the management practices that help to reduce soil blowing include planting grasses and legumes in the rotation, alternating strips of crop and fallow, recropping when feasible, maintaining crop residues on the soil surface with mulch or reduced tillage, using low-crown shovels and sweeps, reducing tillage speeds, maintaining a cloddy or ridged surface, and planting wind barriers such as trees or tall wheatgrass rows. Deep plowing should be avoided on soils that are very shallow to lime.

The primary methods used in this county are to combine the proper width of wind strips and maintaining adequate crop residues on the soil surface. The amount of crop residue needed for good protection varies with the soil, the topography, the size of the field, and the climate. There are enough differences in precipitation and wind velocity within Toole County to cause significantly different erosion hazards from area to area. For specific information on climatic factors and erosion hazards in this county, contact the local office of the Natural Resources Conservation Service.

*Reducing water erosion.* Runoff causes erosion on most of the cropland with slopes of 2 percent or more; however, the majority of water erosion takes place on cropland with slopes of 6 percent or more. The factors that contribute to this are the percent of slope, slope length, type of soil, crop and residue management, and climate. Toole County is influenced heavily by Chinook periods, where snowmelt and runoff occur very quickly, increasing the erosion hazard. Of the factors listed above, only slope length and crop and residue management can be changed by the operator.

A practice that can reduce slope length is a diversion ditch. It can be used to divert runoff water from uphill areas, which are usually steep and grassed or rocky areas. A diversion ditch carries the water away from cropland to grassed areas, or to grassed waterways in the field, in order to prevent gullyng. Diversion ditches are not common in this county due to the expense of construction and the maintenance required.

A grassed waterway is an excellent method to carry runoff water through a cropped field and to avoid gullyng. Farm equipment must be raised when crossing the waterway. The only maintenance required is mowing or harvesting the grass in order to prevent

deep snowpacks from forming in the waterway. Rapid melting of deep snowpacks can cause gullyng even within a grassed waterway.

Practices commonly used in this county to help reduce water erosion are related to crop and residue management. On livestock farms, good hay and pasture crops in rotation with small grains help to reduce soil loss to an acceptable level. On grain farms practices include cross-slope farming, field stripcropping with grass buffer strips, contour stripcropping, and maintaining crop residues on the soil surface. Leaving crop residues on the surface helps to reduce erosion by protecting the soil from raindrop splash and also by reducing overland transport of the soil. Crop residues will help to increase water infiltration into the soil before it begins to runoff.

*Controlling soil salinity.* Saline seep results when excess water moves through a saline soil, commonly formed in glacial till, and collects on top of impermeable underlying shale or bedrock. The problem of excess water occurs mainly in areas of crop-fallow dryland farming. During fallow periods more water is stored in the soil than can be used by the crop. It then dissolves salts in the soil or in the parent material below. When it reaches the impermeable layer, the water begins to move laterally and downslope, dissolving more salts and resurfacing to form saline seep areas. These areas are commonly too wet to farm across and too time-consuming to farm around. Once formed, saline seeps may increase in size at the rate of 5 to 10 percent per year.

The most effective solution to the saline seep problem on nonirrigated cropland is to use the water where it falls. This can be done by recropping or by establishing grasses and legumes in the recharge area. The recharge area is the area of excess water accumulation, and is usually at least ten times the size of the existing seep itself.

Early detection of potential saline seep areas is needed in order to correct the problem. Areas of wet spots or areas of late maturing crops are indicators of problem areas. The prolific growth of foxtail barley or kochia also indicate problem areas. These areas should be examined for soil salinity by soil probing and by soil sampling. Identified seep areas may be complex, with more than one recharge area involved. These areas should be investigated with a drill rig. By placing several shallow wells in the suspected recharge areas, the direction of water flow into the seep area can be determined.

## Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, as described in "Land Capability Classification" (*U.S. Dept. Agric., 1961*), soils generally are grouped at three levels: capability class, subclass, and unit. These levels indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

*Capability classes*, the broadest groups, are designated by numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 5. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7. The local office of the Cooperative Extension Service or the Natural Resources Conservation Service can provide guidance on the use of these soils as cropland.

Areas in class 8 are generally not suitable for crops, pasture, or woodland without a level of management that is impractical. These areas may

have potential for other uses, such as recreational facilities and wildlife habitat.

*Capability subclasses* indicate the dominant limitations in the class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, 2*e*. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the table "Land Capability and Yields per Acre of Crops and Pasture" at the end of this section.

## Prime Farmland and Other Important Farmland

In this section, prime farmland and other important farmland are defined. The soils in the survey area that are considered prime farmland are listed in the table "Prime Farmland" at the end of this section.

### Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes range mainly from 0 to 6 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland where these limitations are overcome by drainage measures, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 261,013 acres, or nearly 21 percent of the survey area, would meet the requirements for prime farmland if an adequate and dependable supply of irrigation water were available.

The map units in the survey area that meet the requirements for prime farmland are listed in the table "Prime Farmland." On the soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

## Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil qualities, location, growing season, and moisture supply needed for the economic production of sustained high yields of a specific high-quality crop when treated and managed by acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, and vegetables.

Unique farmland is used for a specific high-value food or fiber crop; has an adequate supply of available moisture for the specific crop because of stored moisture, precipitation, or irrigation; and has a combination of soil qualities, growing season, temperature, humidity, air drainage, elevation, aspect, and other factors, such as nearness to markets, that favors the production of a specific food or fiber crop.

Lists of unique farmland are developed as needed in cooperation with conservation districts and others.

## Additional Farmland of Statewide Importance

Some areas other than areas of prime and unique farmland are of statewide importance in the production of food, feed, fiber, forage, and oilseed crops. The criteria used in defining and delineating these areas are determined by the appropriate State agency or agencies. Additional farmland of statewide importance generally includes areas that nearly meet the criteria for prime farmland and that economically produce high yields of crops when treated and managed by acceptable farming methods. Some areas can produce as high a yield as areas of prime farmland if conditions are favorable. In some states additional farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

A list of this land has not been maintained for Montana and thus is not presently available.

## Additional Farmland of Local Importance

This land consists of areas that are of local importance in the production of food, feed, fiber, forage, and oilseed crops and are not identified as having national or statewide importance. Where appropriate, this land is identified by local agencies. It may include tracts of land that have been designated for agriculture by local ordinance.

Lists of this land are developed as needed in cooperation with conservation districts and others.

## Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices.

### Soil Erodibility (K) Factor

The soil erodibility factor (K) indicates the susceptibility of a soil to sheet and rill water erosion. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

### Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

### Soil-Loss Tolerance (T) Factor

The soil-loss tolerance factor (T) is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

### Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter.

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

## Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

The table "Windbreaks Suitability Group Species List" shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

## Windbreaks and Environmental Plantings in Toole County

Planning ahead is essential for a successful windbreak. The windbreak location and the selection and arrangement of species within the windbreak are highly important. Provisions for weed control are also necessary. Winter-hardy species should be considered in some locations. The kind of soil should also be considered because not all species grow on all soils.

Soils that have approximately the same degree of soil-related hazards and limitations, and are thus suited to about the same kinds of trees and shrubs, are grouped accordingly. The four groupings in Toole County are part of a statewide system.

Each group is identified by a two-part symbol. In the first three groups, the numbers 1 through 3 indicate progressively more severe limitations.

The second part of the symbol, the letters *M*, *L*, *S*, and *W*, indicate the type of soil-related hazards and limitations. The letter *M* refers to available water capacity, *L* refers to concentrated lime, *S* is salinity and alkalinity, and *W* refers to the permanent water table.

All soils in windbreak suitability group 4 have very severe limitations such as slope, water-holding capacity, drainage, and salinity and alkalinity.

### Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same.

*Group 1* consists of soils that have no soil-related hazards or limitations or only slight hazards or limitations if they are used for windbreaks. Slopes are less than 15 percent.

*Group 2M* consists of soils that have a moderate available water capacity (5 to 10 inches) because of texture, depth, or both. The soils are well drained and are not affected by salinity. A layer of concentrated lime, if it occurs, is below a depth of 24 inches. Slopes are less than 15 percent.

*Group 2L* consists of soils that have a layer of concentrated lime (more than 15 percent calcium carbonate equivalent) at a depth of about 15 to 24 inches. The available water capacity is at least 5 inches. The soils are well drained and are not affected by salinity or alkalinity (the electrical conductivity is less than 4 millimhos per centimeter). Slopes are less than 15 percent.

*Group 2W* consists of soils that have an available water capacity of 5 inches or more. If the soils have a layer of concentrated lime, the layer is below a depth of 15 inches. The depth to a permanent water table is 30 to 60 inches. The soils are not affected by salinity. Slopes are less than 15 percent.

*Group 2S* consists of soils that are moderately affected by salinity (the electrical conductivity is 4 to 12 millimhos per centimeter). The available water capacity is at least 5 inches. A layer of concentrated lime, if it occurs, is at a depth of 15 inches or more. The water table is at a depth of 30 inches or more. Slopes are less than 15 percent.

*Group 3M* consists of soils that have an available water capacity of 2 to 5 inches because of texture, depth, or both. A layer of concentrated lime, if it occurs, is at a depth of 15 inches or more. The soils are well drained and are not affected by salinity (the electrical conductivity is less than 4 millimhos per centimeter).

*Group 3L* consists of soils that have a layer of concentrated lime (more than 15 percent calcium carbonate equivalent) at a depth of less than 15 inches. A permanent water table is at a depth of more than 30 inches. The available water capacity is more than 5 inches. The soils are not affected by salinity (the electrical conductivity is less than 4 millimhos per centimeter). Slopes are less than 15 percent.

*Group 3W* consists of soils that have an available water capacity of 2 inches or more. If the soils have a layer of concentrated lime, the layer is below a depth of 15 inches. The depth to a permanent water table is 30 inches or less. It is more than 10 inches during all or most of the growing season. The soils are not affected by salinity. Slopes are less than 15 percent.

*Group 3S* consists of soils that are severely affected by salinity or alkalinity (the electrical conductivity is 12 to 16 millimhos per centimeter). The available water capacity is 5 inches or more. A layer of concentrated lime, if it occurs, is at a depth of more than 15 inches. A permanent water table is at a depth of 30 inches or more. Slopes are less than 15 percent.

*Group 4* consists of soils that have slopes of more than 15 percent, except for those in areas where the length of the slopes is 100 feet or less, and the less sloping soils that have very severe limitations, including soils that have a very low available water capacity (2 inches or less); very shallow, stony, or gravelly soils; strongly saline and alkali soils, in which the electrical conductivity is more than 16 millimhos per centimeter; and soils that have a pH of more than 9.0. Rock outcrop also is in this group.

## Main Cropland Limitations and Hazards

(See text for a description of the limitations and hazards listed in this table)

Soil name and map symbol	Cropland limitations or hazards
2A: Riverwash-----	Nonsoil material
4B: Brockway-----	Lime content Soil blowing
4C: Brockway-----	Water erosion Lime content Soil blowing
12C: Tally-----	Excessive permeability Soil blowing
12D: Tally-----	Water erosion Excessive permeability Slope Soil blowing.
13B: Tanna-----	Depth to rock Limited available water capacity Restricted permeability Soil blowing
13C: Tanna-----	Depth to rock Water erosion Limited available water capacity Restricted permeability Soil blowing
14A: McKenzie-----	Lime content Ponding Poor tilth Restricted permeability Salt content Soil blowing
15F: Lambeth-----	Water erosion Lime content Slope Soil blowing
16B: Degrand-----	Excessive permeability Limited available water capacity Soil blowing
19B: Kenilworth-----	Restricted permeability Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
20C: Cabba-----	Depth to rock Water erosion Lime content Limited available water capacity Soil blowing
20D: Cabba-----	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
22E: Hillon-----	Water erosion Lime content Restricted permeability Slope Soil blowing
22F: Hillon-----	Water erosion Lime content Restricted permeability Slope Soil blowing
23A: Acal-----	Restricted permeability Surface crusting
26B: Absher-----	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
27B: Attewan-----	Excessive permeability Limited available water capacity Soil blowing
28A: Nishon-----	Ponding Restricted permeability Soil blowing
29B: Nunemaker-----	Lime content Poor tilth Restricted permeability Soil blowing



## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
29C: Nunemaker-----	Water erosion Lime content Poor tilth Restricted permeability Soil blowing
30B: Marvan-----	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing
30C: Marvan-----	Water erosion Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing
32B: Kobase-----	Poor tilth Restricted permeability Soil blowing
32C: Kobase-----	Water erosion Poor tilth Restricted permeability Soil blowing
33B: Phillips-----	Restricted permeability Soil blowing
35B: Assinniboine-----	Soil blowing
35C: Assinniboine-----	Soil blowing
36C: Chinook-----	Water erosion Soil blowing
37B: Evanston-----	Soil blowing
37C: Evanston-----	Water erosion Soil blowing
38B: Ethridge-----	Restricted permeability Soil blowing
39B: Ferd-----	Restricted permeability Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
42B: Joplin-----	Lime content Restricted permeability Soil blowing
42C: Joplin-----	Water erosion Lime content Restricted permeability Soil blowing
44B: Kevin-----	Lime content Restricted permeability Soil blowing
44C: Kevin-----	Water erosion Lime content Restricted permeability Soil blowing
45C: Cozberg-----	Excessive permeability Limited available water capacity Soil blowing
45D: Cozberg-----	Water erosion Excessive permeability Limited available water capacity Slope Soil blowing
47B: Marias-----	Lime content Poor tilth Restricted permeability Soil blowing
48B: Vanda-----	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
48C: Vanda-----	Water erosion Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
49C: Floweree-----	Water erosion Soil blowing
50B: Telstad-----	Restricted permeability Soil blowing
51B: Turner-----	Excessive permeability Limited available water capacity Soil blowing
53D: Sunburst-----	Water erosion Lime content Poor tilth Restricted permeability Slope Soil blowing
53E: Sunburst-----	Water erosion Lime content Poor tilth Restricted permeability Slope Soil blowing
53F: Sunburst-----	Water erosion Lime content Poor tilth Restricted permeability Slope Soil blowing
54B: Trudau-----	Lime content Salt content Soil blowing Surface crusting
58B: Lonna-----	Soil blowing
59B: Hedstrom-----	Excessive permeability Soil blowing
60A: Havre-----	Lime content Poor tilth Soil blowing
62A: Vaeda-----	Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
64B: Nobe-----	Lime content   Limited available water capacity   Poor tilth   Restricted permeability   Salt content   Sodium content   Soil blowing   Surface crusting
67B: Bearpaw-----	Restricted permeability   Soil blowing
68B: Gerber-----	Poor tilth   Restricted permeability   Soil blowing
69A: Vida-----	Lime content   Restricted permeability   Soil blowing
69C: Vida-----	Water erosion   Lime content   Restricted permeability   Soil blowing
71F: Roy-----	Water erosion   Limited available water capacity   Poor tilth   Slope   Soil blowing
72F: Zahill-----	Water erosion   Lime content   Restricted permeability   Slope   Soil blowing
73D: Yetull-----	Water erosion   Excessive permeability   Limited available water capacity   Slope   Soil blowing
74B: Shambo-----	Soil blowing
75B: Farnuf-----	Soil blowing
75C: Farnuf-----	Water erosion   Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
77C: Tinsley-----	Excessive permeability Lime content Limited available water capacity Soil blowing
77E: Tinsley-----	Water erosion Excessive permeability Lime content Limited available water capacity Slope Soil blowing
79B: Yamacall-----	Soil blowing
79C: Yamacall-----	Water erosion Soil blowing
79D: Yamacall-----	Water erosion Slope Soil blowing
80B: Williams-----	Restricted permeability Soil blowing
80C: Williams-----	Water erosion Restricted permeability Soil blowing
82B: Savage-----	Restricted permeability
85B: Benz-----	Lime content Restricted permeability Salt content Sodium content Soil blowing Surface crusting
88C: Perma-----	Limited available water capacity Soil blowing
88E: Perma-----	Water erosion Limited available water capacity Slope Soil blowing
90A: Harlake-----	Lime content Poor tilth Restricted permeability Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
94C: Busby-----	Excessive permeability Soil blowing
94D: Busby-----	Water erosion Excessive permeability Slope Soil blowing
96C: Macar-----	Water erosion Soil blowing
96D: Macar-----	Water erosion Slope Soil blowing
98B: Kremlin-----	Soil blowing
101A: Manly-----	Excessive permeability Lime content Soil blowing
Glendive-----	Lime content Soil blowing
Havre-----	Soil blowing
110A: Korchea-----	Lime content Soil blowing
Kiwanis-----	Excessive permeability Lime content Soil blowing
141A: McKenzie-----	Lime content Limited available water capacity Ponding Poor tilth Restricted permeability Salt content Soil blowing Surface crusting
143A: Meadowcreek-----	Excessive permeability Limited available water capacity Soil blowing Water table
144A: Bigsandy-----	Lime content Restricted permeability Soil blowing Water table

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
162B: Degrand-----	Excessive permeability   Limited available water capacity   Soil blowing 
171F: Delpoint-----	Depth to rock   Water erosion   Lime content   Limited available water capacity   Slope   Soil blowing 
Cabbart-----	Depth to rock   Water erosion   Lime content   Limited available water capacity   Slope   Soil blowing 
181D: Doney-----	Depth to rock   Water erosion   Lime content   Slope   Soil blowing 
Cabba-----	Depth to rock   Water erosion   Lime content   Limited available water capacity   Slope   Soil blowing 
191B: Kenilworth-----	Restricted permeability   Soil blowing 
200F: Badland-----	Nonsoil material 
201F: Cabba-----	Areas of rock outcrop   Depth to rock   Water erosion   Lime content   Limited available water capacity   Slope   Soil blowing 
Rock outcrop-----	Nonsoil material 
202F: Cabba-----	Depth to rock   Water erosion   Lime content   Limited available water capacity   Slope   Soil blowing 

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
202F:	
Dast-----	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
203E:	
Cabba-----	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Doney-----	Depth to rock Water erosion Lime content Slope Soil blowing
211F:	
Cabbart-----	Areas of rock outcrop Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Rock outcrop-----	Nonsoil material
212F:	
Cabbart-----	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Millon-----	Water erosion Lime content Restricted permeability Slope Soil blowing
213E:	
Cabbart-----	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Delpoint-----	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing



## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
221E:	
Hillon-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Kevin-----	Water erosion Lime content Restricted permeability Slope Soil blowing
222E:	
Hillon-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Neldore-----	Depth to rock Water erosion Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
222F:	
Hillon-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Neldore-----	Depth to rock Water erosion Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
224E:	
Hillon-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Joplin-----	Water erosion Lime content Restricted permeability Slope Soil blowing
241C:	
Marmarth-----	Depth to rock Water erosion Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
241C: Evanston-----	Soil blowing
251C: Bascovy-----	Depth to rock Water erosion Limited available water capacity Poor tilth Restricted permeability Soil blowing
252D: Bascovy-----	Depth to rock Water erosion Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
Neldore-----	Depth to rock Water erosion Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
261A: Absher-----	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Nobe-----	Lime content Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
272B: Attewan-----	Excessive permeability Limited available water capacity Soil blowing
300F: Rubble land-----	Nonsoil material
311B: Creed-----	Restricted permeability Salt content Sodium content Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
311B: Gerdrum-----	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing
Absher-----	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
321B: Kobase-----	Lime content Poor tilth Restricted permeability Soil blowing Surface crusting
321C: Kobase-----	Water erosion Lime content Poor tilth Restricted permeability Soil blowing Surface crusting
323C: Sagedale-----	Water erosion Poor tilth Restricted permeability Soil blowing
331B: Phillips-----	Restricted permeability Soil blowing
Elloam-----	Restricted permeability Salt content Sodium content Soil blowing
332B: Phillips-----	Restricted permeability Soil blowing
Kevin-----	Lime content Restricted permeability Soil blowing
364C: Chinook-----	Soil blowing
372B: Evanston-----	Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
373C: Evanston-----	Soil blowing
Tinsley-----	Excessive permeability Lime content Limited available water capacity Soil blowing
374B: Evanston-----	Soil blowing
374C: Evanston-----	Water erosion Soil blowing
378B: Evanston-----	Soil blowing
Evanston, calcareous-----	Lime content Soil blowing
379C: Evanston-----	Water erosion Soil blowing
Busby-----	Excessive permeability Lime content Soil blowing
384B: Ethridge-----	Restricted permeability
386B: Ethridge-----	Restricted permeability Soil blowing
Evanston-----	Soil blowing
391B: Ferd-----	Restricted permeability Soil blowing
Creed-----	Restricted permeability Salt content Sodium content Soil blowing
Gerdrum-----	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing
391C: Ferd-----	Water erosion Restricted permeability Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
391C:	
Creed-----	Water erosion Restricted permeability Salt content Sodium content Soil blowing
Gerdrum-----	Water erosion Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing
402A:	
Gerdrum-----	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing
Absher-----	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
411B:	
Reeder-----	Depth to rock Limited available water capacity Soil blowing
Cabba-----	Depth to rock Lime content Limited available water capacity Soil blowing
411C:	
Reeder-----	Depth to rock Water erosion Limited available water capacity Soil blowing
Cabba-----	Depth to rock Lime content Limited available water capacity Soil blowing
421C:	
Joplin-----	Water erosion Lime content Restricted permeability Soil blowing
Hillon-----	Water erosion Lime content Restricted permeability Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
421D:	
Joplin-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Hillon-----	Water erosion Lime content Restricted permeability Slope Soil blowing
423B:	
Joplin, calcareous-----	Lime content Restricted permeability Soil blowing
Hillon-----	Lime content Restricted permeability Soil blowing
423C:	
Hillon-----	Water erosion Lime content Restricted permeability Soil blowing
Joplin, calcareous-----	Water erosion Lime content Restricted permeability Soil blowing
424C:	
Joplin-----	Lime content Restricted permeability Soil blowing
Hillon-----	Lime content Restricted permeability Soil blowing
425C:	
Joplin, calcareous-----	Water erosion Lime content Restricted permeability Soil blowing
Telstad-----	Water erosion Lime content Restricted permeability Soil blowing
426B:	
Joplin-----	Lime content Restricted permeability Soil blowing
427B:	
Joplin-----	Lime content Restricted permeability Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
427B: Joplin, calcareous-----	Lime content Restricted permeability Soil blowing
427C: Joplin-----	Water erosion Lime content Restricted permeability Soil blowing
Joplin, calcareous-----	Water erosion Lime content Restricted permeability Soil blowing
441C: Kevin-----	Lime content Restricted permeability Soil blowing
Hillon-----	Water erosion Lime content Restricted permeability Soil blowing
443B: Kevin-----	Lime content Restricted permeability Soil blowing
Ferd-----	Restricted permeability Soil blowing
444B: Kevin, calcareous-----	Lime content Restricted permeability Soil blowing
Ferd-----	Restricted permeability Soil blowing
445B: Kevin-----	Lime content Restricted permeability Soil blowing
Kevin, calcareous-----	Lime content Restricted permeability Soil blowing
445C: Kevin, calcareous-----	Water erosion Lime content Restricted permeability Soil blowing
Kevin-----	Water erosion Lime content Restricted permeability Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
446C: Kevin-----	Water erosion Lime content Restricted permeability Soil blowing
Elloam-----	Restricted permeability Salt content Sodium content Soil blowing
451A: Cozberg-----	Excessive permeability Limited available water capacity Soil blowing
Lihen-----	Excessive permeability Lime content Soil blowing
451C: Cozberg-----	Excessive permeability Limited available water capacity Soil blowing
Lihen-----	Excessive permeability Lime content Soil blowing
481A: Bigsag-----	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting Water table
482A: Vanda-----	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
Marvan-----	Lime content Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
503B: Telstad-----	Restricted permeability Soil blowing



## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
503B: Joplin-----	Lime content Restricted permeability Soil blowing
503C: Telstad-----	Water erosion Restricted permeability Soil blowing
Joplin-----	Water erosion Lime content Restricted permeability Soil blowing
504B: Telstad-----	Restricted permeability Soil blowing
Joplin-----	Lime content Restricted permeability Soil blowing
504C: Telstad-----	Water erosion Restricted permeability Soil blowing
Joplin-----	Water erosion Lime content Restricted permeability Soil blowing
511C: Turner-----	Excessive permeability Limited available water capacity Soil blowing
521B: Elloam-----	Restricted permeability Salt content Sodium content Soil blowing
Absher-----	Limited available water capacity Poor tilth Restricted permeability Salt content Sodium content Soil blowing Surface crusting
551E: Lihen-----	Water erosion Excessive permeability Lime content Slope Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
551E: Blanchard-----	Water erosion Excessive permeability Lime content Limited available water capacity Slope Soil blowing
561B: Scobey-----	Restricted permeability Soil blowing
Kevin-----	Lime content Restricted permeability Soil blowing
561C: Scobey-----	Water erosion Restricted permeability Soil blowing
Kevin-----	Water erosion Lime content Restricted permeability Soil blowing
561D: Scobey-----	Water erosion Restricted permeability Slope Soil blowing
Kevin-----	Water erosion Lime content Restricted permeability Slope Soil blowing
563B: Scobey, calcareous-----	Lime content Restricted permeability Soil blowing
571A: Ryell-----	Excessive permeability Flooding Lime content Soil blowing
Rivra-----	Excessive permeability Flooding Lime content Limited available water capacity Soil blowing
572A: Ryell-----	Excessive permeability Flooding Lime content Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
572A: Havre-----	Flooding Soil blowing
581B: Lonna-----	Lime content Soil blowing
581C: Lonna-----	Water erosion Lime content Soil blowing
582B: Lonna-----	Lime content Soil blowing
Ethridge-----	Restricted permeability
601A: Havre-----	Lime content Soil blowing
Glendive-----	Lime content Soil blowing
603A: Havre-----	Flooding Soil blowing
Glendive-----	Flooding Lime content Soil blowing
651E: Fleak-----	Depth to rock Water erosion Excessive permeability Lime content Limited available water capacity Slope Soil blowing
Lihen-----	Water erosion Excessive permeability Lime content Slope Soil blowing
673B: Bearpaw-----	Restricted permeability Soil blowing
Daglum-----	Restricted permeability Salt content Sodium content Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
691B:	
Vida-----	Lime content Restricted permeability Soil blowing
Vida, calcareous-----	Lime content Restricted permeability Soil blowing
Williams-----	Restricted permeability Soil blowing
691C:	
Vida-----	Water erosion Lime content Restricted permeability Soil blowing
Vida, calcareous-----	Water erosion Lime content Restricted permeability Soil blowing
692D:	
Vida, calcareous-----	Water erosion Lime content Restricted permeability Soil blowing
Williams-----	Water erosion Restricted permeability Soil blowing
Zahill-----	Water erosion Lime content Restricted permeability Slope Soil blowing
694C:	
Vida-----	Water erosion Lime content Restricted permeability Soil blowing
Williams-----	Water erosion Restricted permeability Soil blowing
695D:	
Vida-----	Water erosion Lime content Restricted permeability Soil blowing
Williams-----	Water erosion Restricted permeability Soil blowing
Zahill-----	Water erosion Lime content Restricted permeability Slope Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
696E: Vida-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Zahill-----	Water erosion Lime content Restricted permeability Slope Soil blowing
697C: Vida-----	Water erosion Lime content Restricted permeability Soil blowing
Bearpaw-----	Water erosion Restricted permeability Soil blowing
698D: Vida-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Bearpaw-----	Water erosion Restricted permeability Soil blowing
Nishon-----	Ponding Restricted permeability Soil blowing
698E: Vida-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Zahill-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Nishon-----	Ponding Restricted permeability Soil blowing
721E: Zahill-----	Water erosion Lime content Restricted permeability Slope Soil blowing

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
721E: Zahl-----	Water erosion Lime content Restricted permeability Slope Soil blowing
721F: Zahill-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Zahl-----	Water erosion Lime content Restricted permeability Slope Soil blowing
722F: Zahill-----	Water erosion Lime content Restricted permeability Slope Soil blowing
Dast-----	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
Cabba-----	Depth to rock Water erosion Lime content Limited available water capacity Slope Soil blowing
743A: Shambo-----	Soil blowing
Fairway-----	Excessive permeability Lime content Soil blowing Water table
761B: Fairway-----	Excessive permeability Lime content Soil blowing Water table
Bigsandy-----	Flooding Lime content Restricted permeability Soil blowing Water table

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
793B: Yamacall-----	Lime content Soil blowing
793C: Yamacall-----	Water erosion Lime content Soil blowing
793D: Yamacall-----	Water erosion Lime content Slope Soil blowing
831B: Enbar-----	Flooding Soil blowing Water table
Bigsandy-----	Lime content Restricted permeability Soil blowing Water table
Korchea-----	Soil blowing
861F: Stemple-----	Water erosion Limited available water capacity Slope Soil blowing Surface coarse fragments
Rubble land-----	Nonsoil material
862F: Stemple-----	Water erosion Limited available water capacity Slope Soil blowing Surface coarse fragments
Rubble land-----	Nonsoil material
871B: Nesda-----	Excessive permeability Limited available water capacity Soil blowing
Nesda, cool-----	Excessive permeability Flooding Limited available water capacity Soil blowing Surface coarse fragments
881E: Perma-----	Water erosion Limited available water capacity Slope Soil blowing Surface coarse fragments

## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
881E: Whitlash-----	Depth to rock Water erosion Limited available water capacity Slope Soil blowing Surface coarse fragments
881F: Perma-----	Water erosion Limited available water capacity Slope Soil blowing Surface coarse fragments
Whitlash-----	Depth to rock Water erosion Limited available water capacity Slope Soil blowing Surface coarse fragments
942C: Busby-----	Excessive permeability Lime content Soil blowing
Chinook-----	Soil blowing
961B: Macar-----	Lime content Soil blowing
971C: Neldore-----	Depth to rock Water erosion Lime content Limited available water capacity Poor tilth Restricted permeability Soil blowing
Bascovy-----	Depth to rock Water erosion Limited available water capacity Poor tilth Restricted permeability Soil blowing
971F: Neldore-----	Depth to rock Water erosion Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing



## Main Cropland Limitations and Hazards--Continued

Soil name and map symbol	Cropland limitations or hazards
971F: Bascovy-----	Depth to rock Water erosion Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
972F: Neldore-----	Areas of rock outcrop Depth to rock Water erosion Lime content Limited available water capacity Poor tilth Restricted permeability Slope Soil blowing
Lambeth-----	Areas of rock outcrop Water erosion Lime content Slope Soil blowing
Rock outcrop-----	Nonsoil material
DA: Denied access-----	No data
M-W: Miscellaneous water-----	Nonsoil material
W: Water-----	Nonsoil material

## Land Capability And Yields Per Acre Of Crops And Pasture

(Yields in the 'N' columns are for nonirrigated soils; those in the 'I' column are for irrigated soils. Yields are those that can be expected under a high level of nonirrigated and irrigated management by component name. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. The listing of a crop yield does not endorse the use of a soil for that crop.)

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
2A: Riverwash.												
4B: Brockway-----	4E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
4C: Brockway-----	4E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
12C: Tally-----	4E	---	43.0	---	49.0	---	71.0	---	---	---	2.2	---
12D: Tally-----	4E	---	43.0	---	49.0	---	71.0	---	---	---	---	---
13B: Tanna-----	3E	---	29.0	---	33.0	---	49.0	---	---	---	---	---
13C: Tanna-----	3E	---	29.0	---	33.0	---	49.0	---	---	---	---	---
14A: McKenzie-----	6S	---	27.0	---	31.0	---	46.0	---	---	---	---	---
15F: Lambeth-----	7E	---	---	---	---	---	---	---	---	---	---	---
16B: Degrand-----	3E	---	31.0	---	36.0	---	53.0	---	---	---	---	---
19B: Kenilworth-----	3E	---	43.0	---	49.0	---	69.0	---	---	---	---	---
20C: Cabba-----	6S	---	25.0	---	27.0	---	43.0	---	---	---	---	---
20D: Cabba-----	6E	---	21.0	---	23.0	---	37.0	---	---	---	---	---
22E: Hillon-----	6E	---	34.0	---	39.0	---	57.0	---	---	---	---	---
22F: Hillon-----	7E	---	---	---	---	---	---	---	---	---	---	---
23A: Acel-----	4E	---	44.0	---	51.0	---	72.0	---	---	---	---	---
26B: Absher-----	7S	---	---	---	---	---	---	---	---	---	---	---
27B: Attewan-----	3E	---	33.0	---	36.0	---	54.0	---	---	---	---	---

Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
28A: Nishon-----	4W	---	31.0	---	36.0	---	53.0	---	---	---	---	---
29B: Nunemaker-----	4E	---	32.0	---	37.0	---	53.0	---	---	---	---	---
29C: Nunemaker-----	4E	---	32.0	---	37.0	---	53.0	---	---	---	---	---
30B: Marvan-----	4E	---	30.0	---	32.0	---	48.0	---	---	---	---	---
30C: Marvan-----	4E	---	30.0	---	32.0	---	48.0	---	---	---	---	---
32B: Kobase-----	4E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
32C: Kobase-----	4E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
33B: Phillips-----	3E	---	41.0	---	45.0	---	65.0	---	---	---	---	---
35B: Assinniboine----	4E	---	30.0	---	32.0	---	48.0	---	---	---	---	---
35C: Assinniboine----	4E	---	33.0	---	38.0	---	55.0	---	---	---	---	---
36C: Chinook-----	3E	---	34.0	---	38.0	---	56.0	---	---	---	---	---
37B: Evanston-----	3E	---	46.0	---	51.0	---	74.0	---	---	---	---	---
37C: Evanston-----	3E	---	46.0	---	51.0	---	74.0	---	---	---	---	---
38B: Ethridge-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
39B: Ferd-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
42B: Joplin-----	3E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
42C: Joplin-----	3E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
44B: Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
44C: Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
45C: Cozberg-----	4E	---	32.0	---	35.0	---	52.0	---	---	---	---	---

Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
45D: Cozberg-----	4E	---	32.0	---	35.0	---	52.0	---	---	---	---	---
47B: Marias-----	4E	---	38.0	---	43.0	---	62.0	---	---	---	---	---
48B: Vanda-----	7S	---	---	---	---	---	---	---	---	---	---	---
48C: Vanda-----	7S	---	---	---	---	---	---	---	---	---	---	---
49C: Flowerree-----	3E	---	49.0	---	56.0	---	79.0	---	---	---	---	---
50B: Telstad-----	3E	---	47.0	---	53.0	---	76.0	---	---	---	---	---
51B: Turner-----	3E	---	36.0	---	40.0	---	59.0	---	---	---	2.5	---
53D: Sunburst-----	4E	---	27.0	---	31.0	---	46.0	---	---	---	---	---
53E: Sunburst-----	6E	---	---	---	---	---	---	---	---	---	---	---
53F: Sunburst-----	7E	---	---	---	---	---	---	---	---	---	---	---
54B: Trudau-----	6S	---	---	---	---	---	---	---	---	---	---	---
58B: Lonna-----	3E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
59B: Hedstrom-----	4E	---	42.0	---	47.0	---	68.0	---	---	---	1.8	---
60A: Havre-----	4E	4E	42.0	---	48.0	---	68.0	---	1.5	4.0	2.0	5.0
62A: Vaeda-----	7S	---	---	---	---	---	---	---	---	---	---	---
64B: Nobe-----	7S	---	---	---	---	---	---	---	---	---	---	---
67B: Bearpaw-----	3E	---	38.0	---	43.0	---	62.0	---	---	---	2.5	---
68B: Gerber-----	4E	---	51.0	---	59.0	---	83.0	---	---	---	---	---
69A: Vida-----	3E	---	51.0	---	59.0	---	83.0	---	---	---	2.5	---
69C: Vida-----	3E	---	51.0	---	59.0	---	83.0	---	---	---	2.2	---

Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
71F: Roy-----	7E	---	---	---	---	---	---	---	---	---	---	---
72F: Zahill-----	7E	---	---	---	---	---	---	---	---	---	---	---
73D: Yetull-----	6E	---	17.0	---	20.0	---	31.0	---	---	---	---	---
74B: Shambo-----	3E	2E	48.0	---	55.0	---	77.0	---	---	---	2.5	4.0
75B: Farnuf-----	3E	2E	48.0	---	55.0	---	77.0	---	---	---	2.5	4.0
75C: Farnuf-----	3E	3E	48.0	---	55.0	---	77.0	---	---	---	2.2	3.8
77C: Tinsley-----	7S	---	7.0	---	7.0	---	16.0	---	---	---	---	---
77E: Tinsley-----	7E	---	4.0	---	4.0	---	1.0	---	---	---	---	---
79B: Yamacall-----	3E	---	40.0	---	46.0	---	66.0	---	---	---	---	---
79C: Yamacall-----	3E	---	40.0	---	46.0	---	66.0	---	---	---	---	---
79D: Yamacall-----	4E	---	38.0	---	42.0	---	62.0	---	---	---	---	---
80B: Williams-----	3E	---	55.0	---	62.0	---	88.0	---	---	---	2.5	---
80C: Williams-----	3E	---	55.0	---	62.0	---	88.0	---	---	---	2.2	---
82B: Savage-----	3E	3E	51.0	---	57.0	---	80.0	---	---	---	2.5	4.0
85B: Benz-----	6S	---	---	---	---	---	---	---	---	---	---	---
88C: Perma-----	3E	---	26.0	---	30.0	---	45.0	---	---	---	---	---
88E: Perma-----	6E	---	17.0	---	20.0	---	32.0	---	---	---	---	---
90A: Harlake-----	3E	3E	40.0	---	46.0	---	66.0	---	1.5	5.0	1.5	5.0
94C: Busby-----	4E	---	38.0	---	42.0	---	62.0	---	---	---	---	---
94D: Busby-----	4E	---	33.0	---	37.0	---	54.0	---	---	---	---	---



Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
203E:												
Cabba-----	7E	---	9.0	---	9.0	---	19.0	---	---	---	---	---
Doney-----	6E	---	25.0	---	29.0	---	44.0	---	---	---	---	---
211F:												
Cabbart-----	7E	---	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
212F:												
Cabbart-----	7E	---	---	---	---	---	---	---	---	---	---	---
Hillon-----	7E	---	---	---	---	---	---	---	---	---	---	---
213E:												
Cabbart-----	7E	---	---	---	---	---	---	---	---	---	---	---
Delpoint-----	4E	---	23.0	---	26.0	---	41.0	---	---	---	---	---
221E:												
Hillon-----	6E	---	---	---	---	---	---	---	---	---	---	---
Kevin-----	6E	---	---	---	---	---	---	---	---	---	---	---
222E:												
Hillon-----	6E	---	---	---	---	---	---	---	---	---	---	---
Neldore-----	6E	---	16.0	---	18.0	---	30.0	---	---	---	---	---
222F:												
Hillon-----	7E	---	---	---	---	---	---	---	---	---	---	---
Neldore-----	7E	---	---	---	---	---	---	---	---	---	---	---
224E:												
Hillon-----	6E	---	---	---	---	---	---	---	---	---	---	---
Joplin-----	4E	---	42.0	---	47.0	---	68.0	---	---	---	---	---
241C:												
Marmarth-----	3E	---	38.0	---	43.0	---	62.0	---	---	---	---	---
Evanston-----	3E	---	47.0	---	53.0	---	75.0	---	---	---	---	---
251C:												
Bascovy-----	4E	---	34.0	---	39.0	---	57.0	---	---	---	---	---
252D:												
Bascovy-----	4E	---	27.0	---	31.0	---	46.0	---	---	---	---	---
Neldore-----	6E	---	16.0	---	18.0	---	30.0	---	---	---	---	---
261A:												
Absher-----	7S	---	---	---	---	---	---	---	---	---	---	---
Nobe-----	7S	---	---	---	---	---	---	---	---	---	---	---
272B:												
Attewan-----	4E	---	31.0	---	35.0	---	53.0	---	---	---	---	---

Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
300F: Rubble land.												
311B: Creed-----	4S	---	21.0	---	23.0	---	36.0	---	---	---	---	---
Gerdum-----	6S	---	16.0	---	17.0	---	29.0	---	---	---	---	---
Absher-----	7S	---	---	---	---	---	---	---	---	---	---	---
321B: Kobase-----	4E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
321C: Kobase-----	4E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
323C: Sagedale-----	4E	---	51.0	---	59.0	---	83.0	---	---	---	2.2	---
331B: Phillips-----	3E	---	41.0	---	45.0	---	65.0	---	---	---	---	---
Elloam-----	6S	---	21.0	---	23.0	---	38.0	---	---	---	---	---
332B: Phillips-----	3E	---	41.0	---	45.0	---	65.0	---	---	---	---	---
Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
364C: Chinook-----	4E	---	33.0	---	37.0	---	54.0	---	---	---	---	---
372B: Evanston-----	4E	---	46.0	---	51.0	---	74.0	---	---	---	---	---
373C: Evanston-----	3E	---	41.0	---	46.0	---	67.0	---	---	---	---	---
Tinsley-----	7S	---	7.0	---	7.0	---	16.0	---	---	---	---	---
374B: Evanston-----	3E	---	47.0	---	53.0	---	75.0	---	---	---	---	---
374C: Evanston-----	3E	---	47.0	---	53.0	---	75.0	---	---	---	---	---
378B: Evanston-----	3E	---	46.0	---	51.0	---	74.0	---	---	---	---	---
Evanston, calcareous-----	4E	---	42.0	---	48.0	---	68.0	---	---	---	---	---
379C: Evanston-----	3E	---	41.0	---	46.0	---	67.0	---	---	---	---	---
Busby-----	4E	---	30.0	---	34.0	---	50.0	---	---	---	---	---
384B: Ethridge-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---



Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
386B:												
Ethridge-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
Evanston-----	3E	---	41.0	---	46.0	---	67.0	---	---	---	---	---
391B:												
Ferd-----	3E	---	42.0	---	48.0	---	68.0	---	---	---	---	---
Creed-----	4S	---	21.0	---	23.0	---	36.0	---	---	---	---	---
Gerdrum-----	6S	---	16.0	---	17.0	---	29.0	---	---	---	---	---
391C:												
Ferd-----	3E	---	42.0	---	48.0	---	68.0	---	---	---	---	---
Creed-----	4E	---	21.0	---	23.0	---	36.0	---	---	---	---	---
Gerdrum-----	6E	---	16.0	---	17.0	---	29.0	---	---	---	---	---
402A:												
Gerdrum-----	6S	---	15.0	---	17.0	---	28.0	---	---	---	---	---
Absher-----	7S	---	---	---	---	---	---	---	---	---	---	---
411B:												
Reeder-----	3E	---	43.0	---	48.0	---	70.0	---	---	---	---	---
Cabba-----	6S	---	26.0	---	29.0	---	44.0	---	---	---	---	---
411C:												
Reeder-----	3E	---	43.0	---	48.0	---	70.0	---	---	---	---	---
Cabba-----	6S	---	26.0	---	29.0	---	44.0	---	---	---	---	---
421C:												
Joplin-----	3E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
Hillon-----	4E	---	43.0	---	49.0	---	71.0	---	---	---	---	---
421D:												
Joplin-----	4E	---	40.0	---	47.0	---	67.0	---	---	---	---	---
Hillon-----	4E	---	40.0	---	46.0	---	66.0	---	---	---	---	---
423B:												
Joplin, calcareous-----	4E	---	40.0	---	47.0	---	67.0	---	---	---	---	---
Hillon-----	4E	---	43.0	---	49.0	---	71.0	---	---	---	---	---
423C:												
Hillon-----	4E	---	43.0	---	49.0	---	71.0	---	---	---	---	---
Joplin, calcareous-----	4E	---	40.0	---	47.0	---	67.0	---	---	---	---	---
424C:												
Joplin-----	3E	---	44.0	---	49.0	---	71.0	---	---	---	---	---

Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
424C:												
Hillon-----	4E	---	42.0	---	48.0	---	68.0	---	---	---	---	---
425C:												
Joplin,												
calcareous-----	4E	---	40.0	---	47.0	---	67.0	---	---	---	---	---
Telstad-----	4E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
426B:												
Joplin-----	3E	---	44.0	---	51.0	---	72.0	---	---	---	---	---
427B:												
Joplin-----	3E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
Joplin,												
calcareous-----	4E	---	40.0	---	47.0	---	67.0	---	---	---	---	---
427C:												
Joplin-----	3E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
Joplin,												
calcareous-----	4E	---	40.0	---	47.0	---	67.0	---	---	---	---	---
441C:												
Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
Hillon-----	4E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
443B:												
Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
Ferd-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
444B:												
Kevin,												
calcareous-----	4E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
Ferd-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
445B:												
Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
Kevin,												
calcareous-----	4E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
445C:												
Kevin,												
calcareous-----	4E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
446C:												
Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
Elloam-----	6E	---	21.0	---	23.0	---	38.0	---	---	---	---	---
451A:												
Cozberg-----	4E	---	32.0	---	35.0	---	52.0	---	---	---	---	---

Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
451A:												
Lihen-----	4E	---	26.0	---	29.0	---	44.0	---	---	---	---	---
451C:												
Cozberg-----	4E	---	32.0	---	35.0	---	52.0	---	---	---	---	---
Lihen-----	4E	---	26.0	---	29.0	---	44.0	---	---	---	---	---
481A:												
Bigsag-----	7W	---	---	---	---	---	---	---	---	---	---	---
482A:												
Vanda-----	7S	---	---	---	---	---	---	---	---	---	---	---
Marvan-----	6S	---	4.0	---	4.0	---	12.0	---	---	---	---	---
503B:												
Telstad-----	3E	---	47.0	---	53.0	---	76.0	---	---	---	---	---
Joplin-----	3E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
503C:												
Telstad-----	3E	---	47.0	---	53.0	---	76.0	---	---	---	---	---
Joplin-----	3E	---	44.0	---	49.0	---	71.0	---	---	---	---	---
504B:												
Telstad-----	3E	---	47.0	---	53.0	---	76.0	---	---	---	---	---
Joplin-----	3E	---	44.0	---	51.0	---	72.0	---	---	---	---	---
504C:												
Telstad-----	3E	---	47.0	---	53.0	---	76.0	---	---	---	---	---
Joplin-----	3E	---	44.0	---	51.0	---	72.0	---	---	---	---	---
511C:												
Turner-----	4E	---	35.0	---	39.0	---	58.0	---	---	---	2.0	---
521B:												
Elloam-----	6S	---	21.0	---	23.0	---	38.0	---	---	---	---	---
Absher-----	7S	---	---	---	---	---	---	---	---	---	---	---
551E:												
Lihen-----	6E	---	21.0	---	23.0	---	36.0	---	---	---	---	---
Blanchard-----	6E	---	16.0	---	18.0	---	30.0	---	---	---	---	---
561B:												
Scobey-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
561C:												
Scobey-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---
Kevin-----	3E	---	42.0	---	46.0	---	67.0	---	---	---	---	---

Land Capability And Yields Per Acre Of Crops And Pasture--Continued

Map symbol and soil name	Land capability		Spring wheat		Winter wheat		Barley		Grass hay		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu		Bu		Bu		Tons		Tons	
561D:												
Scobey-----	4E	---	36.0	---	40.0	---	58.0	---	---	---	---	---
Kevin-----	4E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
563B:												
Scobey, calcareous-----	4E	---	38.0	---	44.0	---	63.0	---	---	---	---	---
571A:												
Ryell-----	3W	---	35.0	---	40.0	---	59.0	---	---	---	---	---
Rivra-----	6W	---	---	---	---	---	---	---	---	---	---	---
572A:												
Ryell-----	3W	---	35.0	---	40.0	---	59.0	---	---	---	---	---
Havre-----	3W	---	46.0	---	52.0	---	74.0	---	---	---	---	---
581B:												
Lonna-----	4E	---	36.0	---	40.0	---	58.0	---	---	---	---	---
581C:												
Lonna-----	4E	---	36.0	---	40.0	---	58.0	---	---	---	---	---
582B:												
Lonna-----	4E	---	36.0	---	40.0	---	58.0	---	---	---	---	---
Ethridge-----	3E	---	42.0	---	48.0	---	68.0	---	---	---	---	---
601A:												
Havre-----	4E	4E	43.0	---	48.0	---	70.0	---	1.5	4.0	2.0	5.0
Glendive-----	4E	4E	34.0	---	38.0	---	55.0	---	1.0	4.0	1.5	5.0
603A:												
Havre-----	6W	---	46.0	---	52.0	---	74.0	---	1.8	---	1.5	---
Glendive-----	6W	---	38.0	---	43.0	---	62.0	---	1.3	---	1.2	---
651E:												
Fleak-----	7E	---	6.0	---	6.0	---	15.0	---	---	---	---	---
Lihen-----	6E	---	23.0	---	26.0	---	40.0	---	---	---	---	---
673B:												
Bearpaw-----	3E	---	49.0	---	56.0	---	79.0	---	---	---	2.5	---
Daglum-----	4S	---	34.0	---	39.0	---	57.0	---	---	---	2.0	---
691B:												
Vida-----	3E	---	51.0	---	59.0	---	83.0	---	---	---	2.5	---
Vida, calcareous	4E	---	48.0	---	55.0	---	77.0	---	---	---	2.5	---
Williams-----	3E	---	55.0	---	62.0	---	88.0	---	---	---	2.5	---
691C:												
Vida-----	3E	---	51.0	---	59.0	---	83.0	---	---	---	2.2	---

[illegible]



[illegible]

## Prime Farmland

Map symbol	Soil name
37B	Evanston clay loam, 0 to 4 percent slopes (where irrigated)
38B	Ethridge clay loam, 0 to 4 percent slopes (where irrigated)
42B	Joplin clay loam, 0 to 4 percent slopes (where irrigated)
44B	Kevin clay loam, 0 to 4 percent slopes (where irrigated)
50B	Telstad clay loam, 0 to 4 percent slopes (where irrigated)
51B	Turner loam, 0 to 4 percent slopes (where irrigated)
58B	Lonna silt loam, 0 to 4 percent slopes (where irrigated)
67B	Bearpaw clay loam, 0 to 4 percent slopes (where irrigated)
69A	Vida clay loam, 0 to 2 percent slopes (where irrigated)
74B	Shambo loam, 0 to 4 percent slopes (where irrigated)
75B	Farnuf clay loam, 0 to 3 percent slopes (where irrigated)
79B	Yamacall loam, 0 to 4 percent slopes (where irrigated)
80B	Williams clay loam, 0 to 3 percent slopes (where irrigated)
82B	Savage silty clay loam, 0 to 3 percent slopes (where irrigated)
98B	Kremlin loam, 0 to 4 percent slopes (where irrigated)
374B	Evanston loam, 0 to 4 percent slopes (where irrigated)
384B	Ethridge silty clay loam, 0 to 4 percent slopes (where irrigated)
386B	Ethridge-Evanston clay loams, 0 to 4 percent slopes (where irrigated)
426B	Joplin loam, 0 to 4 percent slopes (where irrigated)
503B	Telstad-Joplin clay loams, 0 to 4 percent slopes (where irrigated)
504B	Telstad-Joplin loams, 0 to 4 percent slopes (where irrigated)
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes (where irrigated)



## Windbreak Suitability Groups

(Suitable shrubs and trees with their mature heights are listed in the adjoining Windbreak Suitability Group Species List. Absence of an entry indicates that a windbreak suitability group is not assigned. A dashed entry indicates a woodland unit and a windbreak suitability group is not assigned.)

Soil name and map symbol	Windbreak suitability group
4B: Brockway	3L
12C: Tally	2M
13B: Tanna	3M
14A: McKenzie	2S
15F: Lambeth	4
16B: Degrand	3M
19B: Kenilworth	1
20C: Cabba	3M
22E: Hillon	4
23A: Acel	2M
26B: Absher	3S
27B: Attewan	3M
28A: Nishon	4
29B: Nunemaker	2M
30B: Marvan	2S
32B: Kobase	1
33B: Phillips	1
35B: Assinniboine	2M
36C: Chinook	2M

## Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
37B: Evanston	1
38B: Ethridge	1
39B: Ferd	1
42B: Joplin	1
44B: Kevin	1
45C: Cozberg	2M
47B: Marias	2M
48B: Vanda	3S
49C: Flowerree	1
50B: Telstad	1
51B: Turner	2M
53D: Sunburst	2M
54B: Trudau	3S
58B: Lonna	1
59B: Hedstrom	3M
60A: Havre	1
62A: Vaeda	3S
64B: Nobe	4
67B: Bearpaw	1
68B: Gerber	1
69A: Vida	1

## Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
71F: Roy	4
72F: Zahill	4
73D: Yetull	3M
74B: Shambo	1
75B: Farnuf	1
77C: Tinsley	4
79C: Yamacall	1
80B: Williams	1
82B: Savage	1
85B: Benz	3S
88C: Perma	3M
90A: Harlake	2M
94C: Busby Glendive	2M 2M
96C: Macar	1
98B: Kremlin	1
101A: Hanly Havre	3M 1
110A: Kiwanis Korchea	2M 1
141A: McKenzie	3W
143A: Meadowcreek	2W
144A: Bigsandy	3W

## Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
162B: Degrand	3M
171F: Delpoint Cabbart	4 4
181D: Doney Cabba	3M 3M
191B: Kenilworth	1
201F: Cabba	4
202F: Cabba Dast	4 4
203E: Cabba Doney	4 4
211F: Cabbart	4
212F: Cabbart Hillon	4 4
213E: Cabbart Delpoint	4 3M
221E: Hillon Kevin	4 4
222E: Hillon Neldore	4 4
224E: Joplin Hillon	1 4
241C: Evanston Marmarth	1 2M
251C: Bascovy	2M
252D: Bascovy Neldore	2M 3M

## Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
261A:	
Absher	3S
Nobe	4
272B:	
Attewan	3M
311B:	
Creed	2S
Absher	3S
Gerdrum	3S
321B:	
Kobase	1
323C:	
Sagedale	1
331B:	
Elloam	3S
Phillips	1
332B:	
Kevin	1
Phillips	1
364C:	
Chinook	2M
372B:	
Evanston	1
373C:	
Evanston	1
Tinsley	4
374B:	
Evanston	1
374C:	
Evanston	1
378B:	
Evanston	1
Evanston, calcareous	1
379C:	
Busby	2M
Evanston	1
384B:	
Ethridge	1
386B:	
Ethridge	1
Evanston	1
391B:	
Ferd	1
Gerdrum	3S
Creed	2S

## Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
402A:	
Gerdum	3S
Absher	4
411B:	
Cabba	3M
Reeder	2M
421C:	
Joplin	1
Hillon	1
423B:	
Hillon	1
Joplin, calcareous	1
423C:	
Hillon	1
Joplin, calcareous	1
424C:	
Joplin	1
Hillon	1
425C:	
Joplin, calcareous	1
Telstad	1
426B:	
Joplin	1
427B:	
Joplin	1
Joplin, calcareous	1
441C:	
Kevin	1
Hillon	1
443B:	
Kevin	1
Ferd	1
444B:	
Kevin, calcareous	1
Ferd	1
445B:	
Kevin, calcareous	1
Kevin	1
446C:	
Kevin	1
Elloam	3S
451A:	
Cozberg	2M
Lihen	2M
481A:	
Bigsag	4

## Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
482A:	
Marvan	3S
Vanda	3S
503B:	
Joplin	1
Telstad	1
504B:	
Joplin	1
Telstad	1
511C:	
Turner	2M
521B:	
Absher	3S
Elloam	3S
551E:	
Blanchard	4
Lihen	4
561B:	
Kevin	1
Scobey	1
563B:	
Scobey, calcareous	1
571A:	
Rivra	3M
Ryell	2M
572A:	
Havre	2M
Ryell	2M
581B:	
Lonna	1
582B:	
Ethridge	1
Lonna	1
601A:	
Havre	1
Glendive	2M
603A:	
Havre	1
Glendive	2M
651E:	
Fleak	4
Lihen	3M
673B:	
Bearpaw	1
Daglum	2S

## Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
691B:	
Williams	1
Vida, calcareous	1
Vida	1
692D:	
Zahill	2M
Williams	1
Vida, calcareous	1
694C:	
Williams	1
Vida	1
695D:	
Zahill	2M
Williams	1
Vida	1
696E:	
Zahill	4
Vida	1
697C:	
Bearpaw	1
Vida	1
698D:	
Nishon	4
Bearpaw	1
Vida	1
721E:	
Zahl	4
Zahill	4
722F:	
Cabba	4
Dast	4
Zahill	4
743A:	
Fairway	2W
Shambo	1
761B:	
Fairway	2W
Bigsandy	3W
793B:	
Yamacall	1
831B:	
Korchea	1
Bigsandy	3W
Enbar	2W
871B:	
Nesda	4
881E:	
Whitlash	4
Perma	4



## Windbreak Suitability Groups--Continued

Soil name and map symbol	Windbreak suitability group
942C:	
Chinook	2M
Busby	2M
961B:	
Macar	1
971C:	
Bascovy	2M
Neldore	3M
972F:	
Lambeth	4
Neldore	4

## Windbreaks Suitability Group Species List

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the height for that group.)

Windbreak suitability group	Trees having predicted 20-year average height, in feet, of-				
	<8	8-15	16-25	26-35	>35
1-----	Western sandcherry, skunkbush sumac	Siberian peashrub, green ash, Rocky Mountain juniper, Tatarian honeysuckle, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	-	-
2M-----	Western sandcherry, Nanking cherry	Siberian peashrub, green ash, Rocky Mountain juniper, Siberian crabapple, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	-	-
2S-----	Skunkbush sumac	Siberian peashrub, Rocky Mountain juniper, ponderosa pine, common chokecherry, silver buffaloberry	Russian-olive, Siberian elm	-	-
2W-----	Western sandcherry, purpleosier willow	Redosier dogwood, Siberian crabapple, common chokecherry, lilac	Russian-olive, green ash, ponderosa pine, blue spruce	Golden willow	Plains cottonwood
3M-----	Western sandcherry, Nanking cherry	Siberian peashrub, green ash, Rocky Mountain juniper, Tatarian honeysuckle, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	-	-
3L-----	Western sandcherry, Nanking cherry	Siberian peashrub, green ash, Rocky Mountain juniper, Siberian crabapple, ponderosa pine, blue spruce, common chokecherry, lilac	Russian-olive, Siberian elm	-	-

## Windbreaks Suitability Group Species List--Continued

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the height for that group.)

Windbreak suitability group	Trees having predicted 20-year average height, in feet, of-				
	<8	8-15	16-25	26-35	>35
3S-----	Skunkbush sumac	Siberian peashrub, silver buffaloberry	Russian-olive, Siberian elm	-	-
3W-----	Skunkbush sumac	Silver buffaloberry	Russian-olive	Siberian elm	-



# Range

---

Thirty-eight percent of the county is native range and is used primarily for grazing. It is mostly grazed by domestic livestock; however, it is also used as wildlife habitat, as recreational areas, or for watershed; it also has esthetic value.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on range are closely related to the type of soil. Effective management is based on the relationship between the soils and vegetation and water.

*Range* is defined as land on which the native vegetation (the climax, or natural potential, plant community) is predominantly grasses, grasslike plants, forbs, and shrubs suitable for grazing and browsing. Range includes natural grasslands and savannas; many wetlands; some deserts and tundra; and certain shrub and forb communities. Range receives no regular or frequent cultural treatment. The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

*Grazed forest land* is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

*Native pasture* is defined as land on which the potential (climax) vegetation is forest but which is used and managed primarily for the production of native forage plants. Native pasture includes cutover forest land and forest land that has been cleared and is managed for native or naturalized forage plants.

The table "Rangeland Productivity and Characteristic Plant Communities" at the end of this section shows, for each listed soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in this table follows.

*Range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that

differs from natural plant communities on other range sites in kind, amount, and proportion of range plants.

Many different range sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become established. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and from place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The "Field Office Technical Guide," which is available at local offices of the Natural Resources Conservation Service, can provide specific information about range sites.

*Total production* is the amount of vegetation that can be expected to grow annually on well-managed range that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

*Dry weight* is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

*Characteristic vegetation* consists of the grasses, forbs, and shrubs that make up most of the potential

natural plant community on each soil. The plants are listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

## Range Condition

Range condition is based on a comparison of the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the natural community, the better the range condition.

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants. These plants will eventually die if they are continually grazed. A very severe disturbance can completely destroy the natural community. Under these conditions, the less desirable plants, such as annuals and weedlike plants, can invade. If the plant community has not deteriorated significantly, it eventually can return to dominantly natural plants if proper grazing management is applied.

Four range condition classes are used to show the degree of deterioration of the natural plant community.

An area of rangeland is in *excellent condition* if more than 75 percent of the present plant community is the same as the natural plant community. It is in *good condition* if the natural plants make up 51 to 75 percent of the present plant community, in *fair condition* if those plants make up 26 to 50 percent, and in *poor condition* if they make up less than 25 percent.

Knowledge of the range site and condition is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to determine management objectives, proper grazing systems and stocking rates, suitable wildlife management practices, the potential for recreational uses, and the condition of watersheds.

## Rangeland Management

Rangeland management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of less desirable species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Grazing management is the most important part of any rangeland management program. Proper grazing use, timely deferment of grazing, and planned rotation grazing systems are key practices. The experience of ranchers and research have shown that if no more than one-half of the current year's growth is grazed, a plant community in good or excellent condition can be maintained and one in fair condition can be improved. The remaining one-half enables plants to make and store food for regrowth and root development. As a result, the desirable plants remain healthy and are not replaced by less desirable grasses and weeds. The plant cover also protects the soil from water erosion and soil blowing, improves tilth, increases the rate of water infiltration, and helps to control runoff.

Certain practices commonly are needed to obtain a uniform distribution of grazing. These include developing livestock watering facilities, fencing, properly locating salt and mineral supplements, constructing livestock trails in steeply sloping areas, and riding or herding.

Various kinds of grazing systems can be used in range management. No single grazing system is best under all conditions. The grazing system should increase the quantity and improve the quality of the range vegetation; should meet the needs of the individual operator; and should be designed according to the topography, the type of grazing animals, and the resource management objectives.

Special improvement practices are needed in areas where management practices do not achieve the desired results or where recovery is too slow under forage management alone. These include range seeding, brush management, water spreading, prescribed burning, and mechanical treatment.

Some soils are suited to mechanical treatment for range improvement. On other soils, however, only proper grazing management can improve the range. Many soils in capability classes 1 through 4 are suited to such practices as seeding, mechanical brush and weed control, and water spreading. Those in capability classes 7 and 8, however, are not suitable. Many soils in capability classes 1 through 4 are suited

to tillage for seedbed preparation before native or introduced forage plant species are seeded. Soils in capability class 6 may be suited to limited surface disturbance, such as scarification, for the purpose of seeding and as a means of increasing the rate of water infiltration for seed germination.

Where feasible, mechanical renovation practices, such as shallow chiseling, can help to speed recovery of the desired plants. These practices open up the surface and thus allow the absorption of more moisture and production of the more desirable plants. Mechanical renovation, brush management, and timely deferment of grazing allow recovery of the desired plants.

Seeding may be needed in areas where the less desirable plants are dominant. A clean, firm seedbed should be prepared, suitable species should be selected for seeding, and rest periods should be long enough to allow the new plants to become established.

Special improvement practices can be effective only if the management system helps to keep the desirable plants healthy.

### **Forest Land Understory Vegetation**

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some forest

land can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

The table "Woodland Understory Vegetation" at the end of this section shows, for each soil suitable for forest land, the potential for producing understory vegetation. The *total production* of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimal part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

The table also lists the common names of the *characteristic vegetation* on each soil and the *composition*, by percentage of air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of forest land in which the production of wood crops is highest.

## Rangeland Productivity and Characteristic Plant Communities

(Only the soils that support rangeland vegetation suitable for grazing are listed. Ppt means precipitation.)

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
4B:					
Brockway-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
4C:					
Brockway-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
12C:					
Tally-----	Sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,800	Prairie sandreed-----	25
		Normal	2,300	Bluebunch wheatgrass-----	20
		Unfavorable	1,700	Idaho fescue-----	10
				Needleandthread-----	10
				Rough fescue-----	10
				Columbia needlegrass-----	5
12D:					
Tally-----	Sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,800	Prairie sandreed-----	25
		Normal	2,300	Bluebunch wheatgrass-----	20
		Unfavorable	1,700	Idaho fescue-----	10
				Needleandthread-----	10
				Rough fescue-----	10
				Columbia needlegrass-----	5
13B:					
Tanna-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
13C:					
Tanna-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
14A:					
McKenzie-----	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass-----	30
		Normal	2,500	Basin wildrye-----	30
		Unfavorable	2,000	Green needlegrass-----	20
				Slender wheatgrass-----	5
15F:					
Lambeth-----	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass-----	35
		Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5



## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
16B:					
Degradand-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
19B:					
Kenilworth-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
20C:					
Cabba-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass-----	30
		Normal	1,400	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
20D:					
Cabba-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass-----	30
		Normal	1,400	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
22E:					
Hillon-----	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass-----	35
		Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
22F:					
Hillon-----	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass-----	35
		Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
23A:					
Acel-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
26B:					
Absher-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5
27B:					
Attewan-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
28A:					
Nishon-----	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass-----	30
		Normal	2,500	Basin wildrye-----	30
		Unfavorable	2,000	Green needlegrass-----	20
				Slender wheatgrass-----	5
29B:					
Nunemaker-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
29C:					
Nunemaker-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
30B:					
Marvan-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
30C:					
Marvan-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
32B:					
Kobase-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
32C:					
Kobase-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
33B:					
Phillips-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
35B:					
Assinniboine----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
35C:					
Assinniboine----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
36C:					
Chinook-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
37B:					
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
37C:					
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
38B:					
Ethridge-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
39B:					
Ferd-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
42B:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
42C:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
44B:					
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
44C:					
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry		
			weight		
			Lb/acre		Pct
45C:					
Cozberg-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
45D:					
Cozberg-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
47B:					
Marias-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
48B:					
Vanda-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5
48C:					
Vanda-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5
49C:					
Floweree-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
50B:					
Telstad-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
51B:					
Turner-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
53D:					
Sunburst-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
53E:					
Sunburst-----	Thin clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,400	Bluebunch wheatgrass-----	30
		Normal	1,100	Western wheatgrass-----	15
		Unfavorable	800	Green needlegrass-----	15
				Plains muhly-----	5
53F:					
Sunburst-----	Thin clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,400	Bluebunch wheatgrass-----	30
		Normal	1,100	Western wheatgrass-----	15
		Unfavorable	800	Green needlegrass-----	15
				Plains muhly-----	5
54B:					
Trudau-----	Saline upland, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	600	Western wheatgrass-----	40
		Normal	500	Alkali sacaton-----	15
		Unfavorable	350	Inland saltgrass-----	15
				Nuttall saltbush-----	5
				Greasewood-----	5
				Basin wildrye-----	5
58B:					
Lonna-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
59B:					
Hedstrom-----	Sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,800	Prairie sandreed-----	25
		Normal	2,300	Bluebunch wheatgrass-----	20
		Unfavorable	1,700	Idaho fescue-----	10
				Needleandthread-----	10
				Rough fescue-----	10
				Columbia needlegrass-----	5
60A:					
Havre-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
62A:					
Vaeda-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
64B:					
Nobe-----	Saline upland, 10 to 14 inch	Favorable	600	Western wheatgrass-----	40
	Ppt zone, glaciated plains,	Normal	500	Alkali sacaton-----	15
	North	Unfavorable	350	Inland saltgrass-----	15
				Nuttall saltbush-----	5
				Greasewood-----	5
				Basin wildrye-----	5
67B:					
Bearpaw-----	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
68B:					
Gerber-----	Clayey, 15 to 19 inch Ppt zone,	Favorable	2,400	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,400	Western wheatgrass-----	10
				Idaho fescue-----	10
				Big sagebrush-----	5
				Lupine-----	5
				Columbia needlegrass-----	5
69A:					
Vida-----	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
69C:					
Vida-----	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
71F:					
Roy-----	Clayey, steep, 15 to 19 inch	Favorable	2,000	Bluebunch wheatgrass-----	30
	Ppt zone, Northern Rocky	Normal	1,600	Rough fescue-----	25
	Mountain foothills, North	Unfavorable	800	Columbia needlegrass-----	15
				Western wheatgrass-----	10
				Idaho fescue-----	5
				Creeping juniper-----	5
72F:					
Zahill-----	Thin silty, 15 to 19 inch Ppt	Favorable	2,000	Bluebunch wheatgrass-----	35
	zone, Northern Rocky Mountain	Normal	1,700	Rough fescue-----	20
	foothills, North	Unfavorable	1,200	Idaho fescue-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
73D:					
Yetull-----	Sands, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,400	Prairie sandreed-----	40
		Normal	2,000	Indian ricegrass-----	20
		Unfavorable	1,600	Needleandthread-----	10
				Sand dropseed-----	5
74B:					
Shambo-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
75B:					
Farnuf-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
75C:					
Farnuf-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
77C:					
Tinsley-----	Gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	700	Bluebunch wheatgrass-----	35
		Normal	600	Needleandthread-----	15
		Unfavorable	400	Winterfat-----	10
				Western wheatgrass-----	10
				Plains muhly-----	10
				Yucca-----	5
77E:					
Tinsley-----	Gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	700	Bluebunch wheatgrass-----	35
		Normal	600	Needleandthread-----	15
		Unfavorable	400	Winterfat-----	10
				Western wheatgrass-----	10
				Plains muhly-----	10
				Yucca-----	5
79B:					
Yamacall-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
79C:					
Yamacall-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
79D:					
Yamacall-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
80B:					
Williams-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
80C:					
Williams-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
82B:					
Savage-----	Clayey, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,400	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,400	Western wheatgrass-----	10
				Idaho fescue-----	10
				Big sagebrush-----	5
				Lupine-----	5
				Columbia needlegrass-----	5
85B:					
Benz-----	Saline upland, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	600	Western wheatgrass-----	40
		Normal	500	Alkali sacaton-----	15
		Unfavorable	350	Inland saltgrass-----	15
				Nuttall saltbush-----	5
				Greasewood-----	5
				Basin wildrye-----	5
88C:					
Perma-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
88E:					
Perma-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5



## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
90A:					
Harlake-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
94C:					
Busby-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
94D:					
Busby-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
96C:					
Macar-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
96D:					
Macar-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
98B:					
Kremlin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
101A:					
Hanly-----	Sands, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,400	Prairie sandreed-----	40
		Normal	2,000	Indian ricegrass-----	20
		Unfavorable	1,600	Needleandthread-----	10
				Sand dropseed-----	5
Glendive-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
Havre-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
110A:					
Korchea-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Kiwanis-----	Sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,800	Prairie sandreed-----	25
		Normal	2,300	Bluebunch wheatgrass-----	20
		Unfavorable	1,700	Idaho fescue-----	10
				Needleandthread-----	10
				Rough fescue-----	10
				Columbia needlegrass-----	5
141A:					
McKenzie-----	Saline upland, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	600	Western wheatgrass-----	40
		Normal	500	Alkali sacaton-----	15
		Unfavorable	350	Inland saltgrass-----	15
				Nuttall saltbush-----	5
				Greasewood-----	5
				Basin wildrye-----	5
143A:					
Meadowcreek----	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass-----	20
		Normal	5,000	Prairie cordgrass-----	20
		Unfavorable	4,000	Tufted hairgrass-----	10
				Slender wheatgrass-----	10
				Western wheatgrass-----	5
				Sedge-----	5
				American mannagrass-----	5
144A:					
Bigsandy-----	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass-----	20
		Normal	5,000	Slender wheatgrass-----	10
		Unfavorable	4,000	Tufted hairgrass-----	10
				Sedge-----	5
				American mannagrass-----	5
				Western wheatgrass-----	5
162B:					
Degradand-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
171F:					
Delpoint-----	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass-----	35
		Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
Cabbart-----	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass-----	50
		Normal	900	Western wheatgrass-----	15
		Unfavorable	600	Needleandthread-----	10
				Prairie junegrass-----	5
				Skunkbush sumac-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
181D:					
Doney-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Cabba-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass-----	30
		Normal	1,400	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
191B:					
Kenilworth-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
201F:					
Cabba-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass-----	30
		Normal	1,400	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
202F:					
Cabba-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass-----	30
		Normal	1,400	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
Dast-----	Thin sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,200	Prairie sandreed-----	35
		Normal	1,700	Bluebunch wheatgrass-----	15
		Unfavorable	1,300	Idaho fescue-----	10
				Rough fescue-----	10
				Columbia needlegrass-----	5
				Needleandthread-----	5
				Common snowberry-----	5
203E:					
Cabba-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass-----	30
		Normal	1,400	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
Doney-----	Thin silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,000	Bluebunch wheatgrass-----	35
		Normal	1,700	Rough fescue-----	20
		Unfavorable	1,200	Idaho fescue-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
211F:					
Cabbart-----	Shallow, 10 to 14 inch Ppt	Favorable	1,100	Bluebunch wheatgrass-----	50
	zone, glaciated plains, North	Normal	900	Western wheatgrass-----	15
		Unfavorable	600	Needleandthread-----	10
				Prairie junegrass-----	5
				Skunkbush sumac-----	5
212F:					
Cabbart-----	Shallow, 10 to 14 inch Ppt	Favorable	1,100	Bluebunch wheatgrass-----	50
	zone, glaciated plains, North	Normal	900	Western wheatgrass-----	15
		Unfavorable	600	Needleandthread-----	10
				Prairie junegrass-----	5
				Skunkbush sumac-----	5
Millon-----	Thin silty, 10 to 14 inch Ppt	Favorable	1,450	Bluebunch wheatgrass-----	35
	zone, glaciated plains, North	Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
213E:					
Cabbart-----	Shallow, 10 to 14 inch Ppt	Favorable	1,100	Bluebunch wheatgrass-----	50
	zone, glaciated plains, North	Normal	900	Western wheatgrass-----	15
		Unfavorable	600	Needleandthread-----	10
				Prairie junegrass-----	5
				Skunkbush sumac-----	5
Delpoint-----	Silty, 10 to 14 inch Ppt zone,	Favorable	1,800	Bluebunch wheatgrass-----	30
	glaciated plains, North	Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
221E:					
Millon-----	Thin silty, 10 to 14 inch Ppt	Favorable	1,450	Bluebunch wheatgrass-----	35
	zone, glaciated plains, North	Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
Kevin-----	Thin silty, 10 to 14 inch Ppt	Favorable	1,450	Bluebunch wheatgrass-----	35
	zone, glaciated plains, North	Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
222E:					
Millon-----	Thin silty, 10 to 14 inch Ppt	Favorable	1,450	Bluebunch wheatgrass-----	35
	zone, glaciated plains, North	Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
Neldore-----	Shallow clay, 10 to 14 inch Ppt	Favorable	1,000	Bluebunch wheatgrass-----	50
	zone, glaciated plains, North	Normal	800	Western wheatgrass-----	20
		Unfavorable	500	Needleandthread-----	15
				Plains muhly-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight lb/acre		
					Pct
222F:					
Hillon-----	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass-----	35
		Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
Neldore-----	Shallow clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,000	Bluebunch wheatgrass-----	50
		Normal	800	Western wheatgrass-----	20
		Unfavorable	500	Needleandthread-----	15
				Plains muhly-----	5
224E:					
Hillon-----	Thin silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,450	Bluebunch wheatgrass-----	35
		Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
241C:					
Marmarth-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
251C:					
Bascovy-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
252D:					
Bascovy-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
Neldore-----	Shallow clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,000	Bluebunch wheatgrass-----	50
		Normal	800	Western wheatgrass-----	20
		Unfavorable	500	Needleandthread-----	15
				Plains muhly-----	5
261A:					
Absher-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
261A:					
Nobe-----	Saline upland, 10 to 14 inch	Favorable	600	Western wheatgrass-----	40
	Ppt zone, glaciated plains,	Normal	500	Alkali sacaton-----	15
	North	Unfavorable	350	Inland saltgrass-----	15
				Nuttall saltbush-----	5
				Greasewood-----	5
				Basin wildrye-----	5
272B:					
Attewan-----	Sandy, 10 to 14 inch Ppt zone,	Favorable	2,000	Prairie sandreed-----	35
	glaciated plains, North	Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
311B:					
Creed-----	Clay pan, 10 to 14 inch Ppt	Favorable	1,200	Western wheatgrass-----	35
	zone, glaciated plains, North	Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
Gerdrum-----	Clay pan, 10 to 14 inch Ppt	Favorable	1,200	Western wheatgrass-----	35
	zone, glaciated plains, North	Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
Absher-----	Dense clay, 10 to 14 inch Ppt	Favorable	900	Western wheatgrass-----	40
	zone, glaciated plains, North	Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5
321B:					
Kobase-----	Clayey, 10 to 14 inch Ppt zone,	Favorable	1,800	Western wheatgrass-----	30
	glaciated plains, North	Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
321C:					
Kobase-----	Clayey, 10 to 14 inch Ppt zone,	Favorable	1,800	Western wheatgrass-----	30
	glaciated plains, North	Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
323C:					
Sagedale-----	Clayey, 15 to 19 inch Ppt zone,	Favorable	2,400	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,400	Western wheatgrass-----	10
				Idaho fescue-----	10
				Big sagebrush-----	5
				Lupine-----	5
				Columbia needlegrass-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight lb/acre		
					Pct
331B:					
Phillips-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Elloam-----	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass-----	35
		Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
332B:					
Phillips-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
364C:					
Chinook-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
372B:					
Evanston-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
373C:					
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Tinsley-----	Gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	700	Bluebunch wheatgrass-----	35
		Normal	600	Needleandthread-----	15
		Unfavorable	400	Winterfat-----	10
				Western wheatgrass-----	10
				Plains muhly-----	10
				Yucca-----	5
374B:					
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
374C:					
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
378B:					
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Evanston, calcareous-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
379C:					
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Busby-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
384B:					
Ethridge-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
386B:					
Ethridge-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
Evanston-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
391B:					
Ferd-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Creed-----	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass-----	35
		Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5



## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
391B:					
Gerdum-----	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass-----	35
		Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
391C:					
Ferd-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Creed-----	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass-----	35
		Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
Gerdum-----	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass-----	35
		Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
402A:					
Gerdum-----	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass-----	35
		Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
Absher-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5
411B:					
Reeder-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Cabba-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass-----	30
		Normal	1,400	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry		
			weight Lb/acre		Pct
411C:					
Reeder-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Cabba-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,700	Bluebunch wheatgrass-----	30
		Normal	1,400	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
421C:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Hillon-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
421D:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Hillon-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
423B:					
Joplin, calcareous-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Hillon-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
423C:					
Hillon-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Joplin, calcareous-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
424C:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Hillon-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
425C:					
Joplin, calcareous----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Telstad-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
426B:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
427B:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Joplin, calcareous----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
427C:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Joplin, calcareous----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
441C:					
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
441C:					
Willon-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
443B:					
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Ferd-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
444B:					
Kevin, calcareous----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Ferd-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
445B:					
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Kevin, calcareous----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
445C:					
Kevin, calcareous----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
446C:					
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight Lb/acre		
446C:					Pct
Elloam-----	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass-----	35
		Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
451A:					
Cozberg-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
Lihen-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
451C:					
Cozberg-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
Lihen-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
481A:					
Bigsag-----	Saline lowland, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Alkali sacaton-----	30
		Normal	2,400	Western wheatgrass-----	20
		Unfavorable	1,700	Inland saltgrass-----	10
				Nuttall saltbush-----	5
				Sedge-----	5
				Greasewood-----	5
482A:					
Vanda-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5
Marvan-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5
503B:					
Telstad-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
503B:					
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
503C:					
Telstad-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
504B:					
Telstad-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
504C:					
Telstad-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Joplin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
511C:					
Turner-----	Sandy, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,600	Prairie sandreed-----	25
		Normal	2,200	Bluebunch wheatgrass-----	20
		Unfavorable	1,700	Idaho fescue-----	10
				Needleandthread-----	10
				Rough fescue-----	10
				Columbia needlegrass-----	5
521B:					
Elloam-----	Clay pan, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,200	Western wheatgrass-----	35
		Normal	900	Green needlegrass-----	15
		Unfavorable	600	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
Absher-----	Dense clay, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	900	Western wheatgrass-----	40
		Normal	600	Green needlegrass-----	20
		Unfavorable	400	Canby bluegrass-----	10
				Nuttall saltbush-----	5
				Winterfat-----	5
				Greasewood-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
551E:					
Lihen-----	Sands, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Prairie sandreed-----	30
		Normal	2,300	Needleandthread-----	20
		Unfavorable	2,000	Indian ricegrass-----	5
				Sand bluestem-----	5
Blanchard-----	Sands, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Prairie sandreed-----	30
		Normal	2,300	Needleandthread-----	20
		Unfavorable	2,000	Indian ricegrass-----	5
				Sand bluestem-----	5
561B:					
Scobey-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
561C:					
Scobey-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
561D:					
Scobey-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Kevin-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
563B:					
Scobey, calcareous-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
571A:					
Ryell-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
571A:					
Rivra-----	Shallow to gravel, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass-----	50
		Normal	900	Needleandthread-----	15
		Unfavorable	600	Western wheatgrass-----	10
				Winterfat-----	5
				Plains muhly-----	5
572A:					
Ryell-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Havre-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
581B:					
Lonna-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
581C:					
Lonna-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
582B:					
Lonna-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Ethridge-----	Clayey, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Western wheatgrass-----	30
		Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
601A:					
Havre-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
Glendive-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
603A:					
Havre-----	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass-----	30
		Normal	2,500	Basin wildrye-----	30
		Unfavorable	2,000	Green needlegrass-----	20
				Slender wheatgrass-----	5



## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
603A:					
Glendive-----	Overflow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	3,000	Western wheatgrass-----	30
		Normal	2,500	Basin wildrye-----	30
		Unfavorable	2,000	Green needlegrass-----	20
				Slender wheatgrass-----	5
651E:					
Fleak-----	Shallow, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,100	Bluebunch wheatgrass-----	50
		Normal	900	Western wheatgrass-----	15
		Unfavorable	600	Needleandthread-----	10
				Prairie junegrass-----	5
				Skunkbush sumac-----	5
Lihen-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
673B:					
Bearpaw-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Daglum-----	Clay pan, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,400	Western wheatgrass-----	35
		Normal	1,000	Green needlegrass-----	15
		Unfavorable	700	Winterfat-----	10
				Needleandthread-----	10
				Nuttall saltbush-----	5
				Big sagebrush-----	5
691B:					
Vida-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Vida, calcareous	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
691B:					
Williams-----	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
691C:					
Vida-----	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Vida, calcareous	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Williams-----	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
692D:					
Vida, calcareous	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Williams-----	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Zahill-----	Silty, 15 to 19 inch Ppt zone,	Favorable	2,500	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
694C:					
Vida-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Williams-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
695D:					
Vida-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Williams-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Zahill-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
696E:					
Vida-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Zahill-----	Thin silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,000	Bluebunch wheatgrass-----	35
		Normal	1,700	Rough fescue-----	20
		Unfavorable	1,200	Idaho fescue-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
697C:					
Vida-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Bearpaw-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
698D:					
Vida-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Bearpaw-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Nishon-----	Overflow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	3,800	Basin wildrye-----	25
		Normal	3,300	Western wheatgrass-----	15
		Unfavorable	2,600	Green needlegrass-----	15
				Sedge-----	10
				Columbia needlegrass-----	10
				Rough fescue-----	5
				Slender wheatgrass-----	5
698E:					
Vida-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Zahill-----	Thin silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,000	Bluebunch wheatgrass-----	35
		Normal	1,700	Rough fescue-----	20
		Unfavorable	1,200	Idaho fescue-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
698E:					
Nishon-----	Overflow, 15 to 19 inch Ppt	Favorable	3,800	Basin wildrye-----	25
	zone, Northern Rocky Mountain	Normal	3,300	Western wheatgrass-----	15
	foothills, North	Unfavorable	2,600	Green needlegrass-----	15
				Sedge-----	10
				Columbia needlegrass-----	10
				Rough fescue-----	5
				Slender wheatgrass-----	5
721E:					
Zahill-----	Thin silty, 15 to 19 inch Ppt	Favorable	2,000	Bluebunch wheatgrass-----	35
	zone, Northern Rocky Mountain	Normal	1,700	Rough fescue-----	20
	foothills, North	Unfavorable	1,200	Idaho fescue-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Zahl-----	Silty, steep, 15 to 19 inch Ppt	Favorable	2,000	Bluebunch wheatgrass-----	60
	zone, Northern Rocky Mountain	Normal	1,400	Columbia needlegrass-----	10
	foothills, North	Unfavorable	900	Rough fescue-----	10
				Arrowleaf balsamroot-----	5
				Common snowberry-----	5
721F:					
Zahill-----	Thin silty, 15 to 19 inch Ppt	Favorable	2,000	Bluebunch wheatgrass-----	35
	zone, Northern Rocky Mountain	Normal	1,700	Rough fescue-----	20
	foothills, North	Unfavorable	1,200	Idaho fescue-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Zahl-----	Silty, steep, 15 to 19 inch Ppt	Favorable	2,200	Bluebunch wheatgrass-----	60
	zone, Northern Rocky Mountain	Normal	1,600	Columbia needlegrass-----	10
	foothills, North	Unfavorable	1,000	Rough fescue-----	10
				Arrowleaf balsamroot-----	5
				Common snowberry-----	5
722F:					
Zahill-----	Thin silty, 15 to 19 inch Ppt	Favorable	2,000	Bluebunch wheatgrass-----	35
	zone, Northern Rocky Mountain	Normal	1,700	Rough fescue-----	20
	foothills, North	Unfavorable	1,200	Idaho fescue-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Dast-----	Thin sandy, 15 to 19 inch Ppt	Favorable	2,200	Prairie sandreed-----	35
	zone, Northern Rocky Mountain	Normal	1,700	Bluebunch wheatgrass-----	15
	foothills, North	Unfavorable	1,300	Idaho fescue-----	10
				Rough fescue-----	10
				Columbia needlegrass-----	5
				Needleandthread-----	5
				Common snowberry-----	5
Cabba-----	Shallow, 15 to 19 inch Ppt	Favorable	1,700	Bluebunch wheatgrass-----	30
	zone, Northern Rocky Mountain	Normal	1,400	Idaho fescue-----	20
	foothills, North	Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
743A:					
Shambo-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Fairway-----	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass-----	20
		Normal	5,000	Prairie cordgrass-----	20
		Unfavorable	4,000	Tufted hairgrass-----	10
				Slender wheatgrass-----	10
				Western wheatgrass-----	5
				Sedge-----	5
				American mannagrass-----	5
761B:					
Fairway-----	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass-----	20
		Normal	5,000	Prairie cordgrass-----	20
		Unfavorable	4,000	Tufted hairgrass-----	10
				Slender wheatgrass-----	10
				Western wheatgrass-----	5
				Sedge-----	5
				American mannagrass-----	5
Bigsandy-----	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass-----	20
		Normal	5,000	Prairie cordgrass-----	20
		Unfavorable	4,000	Tufted hairgrass-----	10
				Slender wheatgrass-----	10
				Western wheatgrass-----	5
				Sedge-----	5
				American mannagrass-----	5
793B:					
Yamacall-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
793C:					
Yamacall-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
793D:					
Yamacall-----	Silty, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	1,800	Bluebunch wheatgrass-----	30
		Normal	1,400	Western wheatgrass-----	25
		Unfavorable	1,000	Green needlegrass-----	20
				Needleandthread-----	15
831B:					
Enbar-----	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass-----	20
		Normal	5,000	Prairie cordgrass-----	20
		Unfavorable	4,000	Tufted hairgrass-----	10
				Slender wheatgrass-----	10
				Western wheatgrass-----	5
				Sedge-----	5
				American mannagrass-----	5

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight lb/acre		
					Pot
831B:					
Big sandy-----	Subirrigated, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	6,000	Northern reedgrass-----	20
		Normal	5,000	Prairie cordgrass-----	20
		Unfavorable	4,000	Tufted hairgrass-----	10
				Slender wheatgrass-----	10
				Western wheatgrass-----	5
				Sedge-----	5
				American mannagrass-----	5
Korchea-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
881E:					
Perma-----	Silty, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,500	Bluebunch wheatgrass-----	30
		Normal	2,000	Rough fescue-----	20
		Unfavorable	1,500	Idaho fescue-----	10
				Western wheatgrass-----	10
				Columbia needlegrass-----	5
				Green needlegrass-----	5
				Needleandthread-----	5
Whitlash-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,500	Bluebunch wheatgrass-----	30
		Normal	1,200	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
881F:					
Perma-----	Silty, steep, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	2,200	Rough fescue-----	60
		Normal	1,600	Idaho fescue-----	10
		Unfavorable	1,000	Columbia needlegrass-----	10
				Creeping juniper-----	5
				Common snowberry-----	5
				Mountain brome-----	5
Whitlash-----	Shallow, 15 to 19 inch Ppt zone, Northern Rocky Mountain foothills, North	Favorable	1,500	Bluebunch wheatgrass-----	30
		Normal	1,200	Idaho fescue-----	20
		Unfavorable	800	Rough fescue-----	15
				Western wheatgrass-----	10
				Green needlegrass-----	10
942C:					
Busby-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10
Chinook-----	Sandy, 10 to 14 inch Ppt zone, glaciated plains, North	Favorable	2,000	Prairie sandreed-----	35
		Normal	1,500	Needleandthread-----	20
		Unfavorable	1,000	Bluebunch wheatgrass-----	15
				Western wheatgrass-----	10
				Indian ricegrass-----	10

## Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
961B:					
Macar-----	Clayey, 15 to 19 inch Ppt zone,	Favorable	2,400	Bluebunch wheatgrass-----	30
	Northern Rocky Mountain	Normal	2,000	Rough fescue-----	20
	foothills, North	Unfavorable	1,400	Western wheatgrass-----	10
				Idaho fescue-----	10
				Big sagebrush-----	5
				Lupine-----	5
				Columbia needlegrass-----	5
971C:					
Neldore-----	Shallow clay, 10 to 14 inch Ppt	Favorable	1,000	Bluebunch wheatgrass-----	50
	zone, glaciated plains, North	Normal	800	Western wheatgrass-----	20
		Unfavorable	500	Needleandthread-----	15
				Plains muhly-----	5
Bascovy-----	Clayey, 10 to 14 inch Ppt zone,	Favorable	1,800	Western wheatgrass-----	30
	glaciated plains, North	Normal	1,300	Green needlegrass-----	30
		Unfavorable	900	Bluebunch wheatgrass-----	20
				Big sagebrush-----	5
				Winterfat-----	5
971F:					
Neldore-----	Shallow clay, 10 to 14 inch Ppt	Favorable	1,000	Bluebunch wheatgrass-----	50
	zone, glaciated plains, North	Normal	800	Western wheatgrass-----	20
		Unfavorable	500	Needleandthread-----	15
				Plains muhly-----	5
Bascovy-----	Thin clayey, 10 to 14 inch Ppt	Favorable	1,400	Bluebunch wheatgrass-----	30
	zone, glaciated plains, North	Normal	1,100	Western wheatgrass-----	15
		Unfavorable	800	Green needlegrass-----	15
				Plains muhly-----	5
972F:					
Neldore-----	Shallow clay, 10 to 14 inch Ppt	Favorable	1,000	Bluebunch wheatgrass-----	50
	zone, glaciated plains, North	Normal	800	Western wheatgrass-----	20
		Unfavorable	500	Needleandthread-----	15
				Plains muhly-----	5
Lambeth-----	Thin silty, 10 to 14 inch Ppt	Favorable	1,450	Bluebunch wheatgrass-----	35
	zone, glaciated plains, North	Normal	1,200	Western wheatgrass-----	20
		Unfavorable	850	Needleandthread-----	15
				Green needlegrass-----	10
				Plains muhly-----	5



## Woodland Understory Vegetation

(Absence of an entry indicates that data were not available)

Map symbol and soil name	Total production		Characteristic vegetation	Compo- sition
	Kind of year	Dry weight		
		Lb/acre		Pct
861F:				
Stemple-----	Favorable	350	Common beargrass-----	20
	Normal	300	Blue huckleberry-----	10
	Unfavorable	250	Grouse whortleberry-----	10
			Pinegrass-----	10
			Common snowberry-----	5
			Heartleaf arnica-----	5
			Raceme pussytoes-----	5
			Rusty menziesia-----	5
			White spirea-----	5
			Elk sedge-----	2
			Oregongrape-----	2
			Twinflower-----	2
862F:				
Stemple-----	Favorable	400	Common beargrass-----	20
	Normal	300	Blue huckleberry-----	10
	Unfavorable	200	Grouse whortleberry-----	10
			Pinegrass-----	10
			Common snowberry-----	5
			Heartleaf arnica-----	5
			Raceme pussytoes-----	5
			Rusty menziesia-----	5
			White spirea-----	5
			Elk sedge-----	2
			Oregongrape-----	2
			Twinflower-----	2
871B:				
Nesda, cool-----	Favorable	600	Shrubby cinquefoil-----	25
	Normal	500	Richardson needlegrass-----	20
	Unfavorable	400	Snowberry-----	15
			Common chokecherry-----	5
			Silverberry-----	5



# Forest Land

---

The tables "Forest Land Productivity" and "Forest Land Management" can be used by forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed.

## Woodland Ordination System

The table "Forest Land Management" lists the ordination (woodland suitability) symbol for each soil. The ordination system is a nationwide uniform system of labeling soils or groups of soils that are similar in use and management. The primary factors evaluated in the woodland ordination system are productivity of the forest overstory tree species and the principal soil properties resulting in hazards and limitations that affect forest management. There are three parts of the ordination system—class, subclass, and group. The class and subclass are referred to as the ordination symbol.

### Ordination Class Symbol

The first element of the ordination symbol is a number that denotes potential productivity in terms of cubic meters of wood per hectare per year for the indicator tree species. The larger the number, the greater the potential productivity. Potential productivity is based on site index and the corresponding culmination of mean annual increment. For example, the number 1 indicates a potential production of 1 cubic meter of wood per hectare per year (14.3 cubic feet per acre per year) and 10 indicates a potential production of 10 cubic meters of wood per hectare per year (143 cubic feet per acre per year).

*Indicator species* is a species that is common in the area and is generally, but not necessarily, the most productive on the soil. It is the species that determines the ordination class. It is the first species listed for a particular map unit in the table "Forest Land Productivity." This table shows the productivity for all species where data have been collected.

*Site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a

specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The site indexes shown in the table "Forest Land Productivity" are averages based on measurements made at sites that are representative of the soil series. When the site index and forest land productivity of different soils are compared, the values for the same tree species should be compared. The higher the site index number, the more productive the soil for that species. Site index values are used in conjunction with yield tables to determine average annual yields. Indirectly, they are used to determine the productivity class in the ordination class symbol.

### Ordination Subclass Symbol

The second element of the ordination symbol, or subclass, is a capital letter that indicates certain soil or physiographic characteristics that contribute to important hazards or limitations to be considered in management. The subclasses are defined as follows:

*Subclass X* indicates that forest land use and management are limited by stones or rocks.

*Subclass W* indicates that forest land use and management are significantly limited by excess water, either seasonally or throughout the year. Restricted drainage, a high water table, or flooding can adversely affect either stand development or management.

*Subclass T* indicates that the root zone has toxic substances. Excessive alkalinity, acidity, sodium salts, or other toxic substances impede the development of desirable species.

*Subclass D* indicates that forest land use and management are limited by a restricted rooting depth. The rooting depth is restricted by hard bedrock, a hardpan, or other restrictive layers in the soil.

*Subclass C* indicates that forest land use and management are limited by the kind or amount of clay in the upper part of the soil.

*Subclass S* indicates that the soil is sandy, has a low available water capacity, and normally has a low content of available plant nutrients. The use of equipment is limited during dry periods.

*Subclass F* indicates that forest land use and management are limited by a high content of rock

fragments that are larger than 2 millimeters and smaller than 10 inches. This subclass includes flaggy soils.

*Subclass R* indicates that forest land use and management are limited by excessive slope.

*Subclass A* indicates that no significant limitations affect forest land use and management.

## Forest Land Management and Productivity

Information about the productivity and management of the forested map units in the survey area is given in the tables "Forest Land Management" and "Forest Land Productivity."

### Management Concerns

In the table "Forest Land Management," the soils are rated for the erosion hazard, the equipment limitation, seedling mortality, the windthrow hazard, and plant competition.

The *erosion hazard* is *slight* if the expected soil loss is small; *moderate* if some measures are needed to control erosion during logging and road construction; and *severe* if intensive management or special equipment and methods are needed to prevent excessive soil loss.

The *equipment limitation* is *slight* if the use of equipment is not limited to a particular kind of equipment or time of year; *moderate* if there is a short seasonal limitation or a need for some modification in the management of equipment; and *severe* if there is a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

*Seedling mortality* ratings are for seedlings that are from a good planting stock and that are properly planted during a period of average rainfall. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

*Windthrow hazard* is *slight* if trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate* if some trees are blown down during periods of excessive soil wetness and strong winds; and *severe* if many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

*Plant competition* is *slight* if there is little or no competition from other plants; *moderate* if plant competition is expected to hinder the development of a fully stocked stand of desirable trees; and *severe* if plant competition is expected to prevent the establishment of a desirable stand unless the site is

intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

### Potential Productivity

The potential productivity of merchantable or *common trees* is expressed as a site index, which is described under the heading "Ordination Class Symbol." Commonly grown trees are those that forest land managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The column *trees that stands are commonly managed for* in the table "Forest Land Productivity" lists trees that are suitable for commercial wood production and that are suited to the soils.

### Forest Access Road Limitations and Hazards

The major management concerns affecting the use of the detailed soil map units in the survey area for forest access roads are listed in the table "Main Forest Access Road Limitations and Hazards." The significance of each limitation or hazard and the criteria used to determine the limitation or hazard are described in this section.

*Areas of rock outcrop* and *depth to bedrock* can increase the cost of road construction and influence route planning. Constructing the roads is difficult because of the need for rock removal and for additional soil material to provide a suitable road surface.

*Boulders* increase the cost of road construction and influence route planning. Construction is difficult mainly because of the need for extraction and disposal of the boulders.

*Dustiness* of the road surface material may cause safety problems and accelerate equipment wear. Dust-abatement measures are needed during dry periods.

The erodibility of the soil material in the roadbed influences the probability of *water erosion* resulting from the channeling of runoff in the roadway. Erosion can result in the sedimentation of streams. It can be controlled by reducing road grades and controlling runoff onto and off of the road surface through the installation of drainage measures.

*Flooding* in the area where a road is constructed may restrict use, result in damage to the roadway, and result in the sedimentation of waterways. The hazard of flooding can be reduced by installing a drainage system, elevating the roadbed, and using riprap and diversions.

*Low soil strength* of the soil material used to construct the road surface can result in rutting, in

drainage problems, and in poor trafficability during wet periods. The road should be used only during dry periods or when the surface is frozen. Surfacing with material of suitable strength and installing a drainage system can help to overcome this limitation.

Roadbed material that has a high *shrink-swell potential* shrinks and swells markedly during dry and wet periods. Excessive shrinking and swelling can damage the road surface or other features, such as bridge abutments, culverts, and erosion-control structures.

A steep *slope* results in increased construction and maintenance costs and increased sedimentation because of the large cuts necessary to create an adequate roadbed. Seeding the cut slope to suitable vegetation minimizes sedimentation. Large cuts can increase instability of the slope. Where slumping is a hazard, slope failure can become a significant maintenance and environmental problem. Areas where the slope is steep should not be used as sites for roads.

*Slumping* causes safety problems and increases maintenance costs. Frequent clearing of slumped soil in the roadbed or rebuilding of the roadway may be needed to keep the road serviceable and drainage systems functioning.

*Stones* cause problems in maintaining a smooth road surface that has good trafficability. Unless the stones are removed, additions of suitable stone-free material may be needed when the road is surfaced.

Roads built across soils that have a *water table* may require substantial ballast, fabric, internal drainage systems, and other measures that maintain a road surface that has good trafficability. Construction and use of the road only during periods when the water table is not near the surface or when the road is frozen help to maintain trafficability and reduce the potential for site damage.

Following is an explanation of the criteria used to determine the limitations or hazards.

*Areas of rock outcrop.*—Rock outcrop is a named component of the map unit.

*Areas of rubble land.*—Rubble land is a named component of the map unit.

*Boulders.*—The terms describing the texture within a depth of 24 inches include a bouldery modifier, or the soil is a bouldery phase.

*Depth to rock.*—Hard bedrock is within a depth of 60 inches.

*Dustiness.*—The surface layer is silt, silt loam, loam, or very fine sandy loam.

*Water erosion.*—The surface K factor multiplied by the upper slope limit is more than 10.

*Flooding.*—The component of the map unit is occasionally flooded or frequently flooded.

*Low soil strength.*—The component of the map unit has one of the following Unified classifications within the 60-inch profile: ML, CL, MH, CH, OL, PT, or GC.

*Shrink-swell potential.*—The component of the map unit has a high shrink-swell potential in a layer that is at least 10 inches thick and is within 40 inches of the surface.

*Slope.*—The upper slope limit is more than 35 percent.

*Slumping.*—The component of the map unit meets the requirements for low soil strength and has slopes of more than 35 percent.

*Stones.*—The terms describing the texture within the depth of 24 inches include a very stony or extremely stony modifier, or the soil is a very stony or extremely stony phase.

*Water table.*—The component of the map unit has a water table within a depth of 60 inches.

## Forest Land Management and Productivity for Toole County

Approximately 4,500 acres in Toole County are forested or have the potential to support forest. Sixty-five percent of the forested acreage is commercial forest land (capable of producing 20 cubic feet of wood per acre per year or more, when yields are computed at the culmination of mean annual increment, (CMAI). The commercial forest land is generally of low productivity, producing less than 50 cubic feet per acre per year when computed at CMAI. The low productivity of the area, the small acreage in forest, the young age of the tree stands (generally less than 100 years), and the small tree diameters limit the sawtimber volume available. Consequently, limited harvesting of the timber resource has occurred.

Soils vary in their ability to support the growth of trees. Soil depth, fertility, texture, and the available water capacity influence tree growth. Elevation, aspect, soil type, and climate determine the kinds of trees that can be expected on any site, and their growth rate. Forested soils in the county range from shallow to very deep, from nongravely to extremely gravely, and from loamy textured to sandy textured. Because of differences among the soils as well as differences in climate, topography, and geology, the forests vary in composition and productivity. Forest lands within the survey area occur mostly on West Butte and Gold Butte, of the Sweetgrass Hills and along the Marias River.

The major components of the forest overstory are Plains cottonwood, black cottonwood, and narrowleaf cottonwood. These components are growing on soils developed in recent alluvium along the Marias River. The rarely and occasionally flooded phases of Nesda soils are typically associated with the cottonwood forests.

On the uplands, toward the mountain front, there is a narrow band of forest occurring on scattered northerly aspects where Douglas-fir forms the dominant cover type. Limber pine is rare. Common understory species are mountain maple, saskatoon serviceberry, Oregon-grape, common juniper, and white spirea. The soil most commonly associated with these plant communities is Stemple, low elevation phase.

Lodgepole pine becomes the dominant cover type at elevations above 4,500 feet. They are on soils of the Stemple, low elevation phase. Douglas-fir can be found reproducing in the understory of the lodgepole pine. Common understory species are dwarf huckleberry, white spirea, bedstraw, pinegrass, wintergreen, common juniper, and twinflower. Four species of huckleberry are known to occur in the understory plant community: dwarf huckleberry, grouse whortleberry, blue huckleberry, and myrtle whortleberry. The dwarf huckleberry is the huckleberry most commonly encountered. These plant communities are also on soils of the Stemple, low elevation phase. Within the area dominated by lodgepole pine, and where Douglas-fir is reproducing in the understory, scattered small stands of Douglas-fir do occur. Douglas-fir seldom occurs at elevations above 5,700 feet. Within the elevational zone where Douglas-fir is associated with lodgepole pine, the lodgepole pine is more productive than at higher elevations where Douglas-fir is no longer a stand component. At elevations above 5,700 feet where Douglas-fir is no longer associated with stands of lodgepole pine, soils of the Stemple, high elevation phase occur. The associated forest understory plant community is similar to that listed for the Stemple, low elevation phase; however, grouse whortleberry and myrtle whortleberry become more common and dwarf huckleberry rare. At the highest elevations where Stemple, high elevation phase soils occur, are mixed stands of whitebark pine, lodgepole pine, and subalpine fir.

To aid those who manage forest land in the soil survey area, soil interpretations relating to woodland use and management have been developed. Items considered for interpretation are: site index, mean annual forest overstory yields in boardfeet and cubic feet per acre, erosion hazard, equipment limitations,

plant competition, seedling mortality, windthrow hazard, species suitability, and the kinds and amounts of understory plants.

Forest land management information for each forested soil is contained in the tables on the following pages.

Ratings of the erosion hazard indicate the risk of soil loss in a well-managed woodland area. These ratings were made on the basis of the timber on a soil having been harvested by the clear-cut method and slash burned. It is assumed reasonable care is used in logging so that funnelling of skid trails, which concentrate water, does not occur. It is also assumed that excessive disturbance did not occur and that some material from slash disposal remained.

Ratings of equipment limitations reflect the characteristics and conditions of the soil that restrict use of equipment that is generally needed in woodland management or harvesting. Equipment limitations in this survey area are related to logging operations. Of prime consideration were difficulties encountered in yarding logs, and the influence of logging activities on soil properties. Primary soil features considered in making this rating were slope, soil texture, soil depth, seasonal soil wetness, and stoniness.

Seedling mortality ratings for this county indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during periods of average rainfall. As interpreted in this survey, the above criteria apply to planting stock of one or two years of age, with the evaluation period beginning at the time of planting. For natural regeneration, the evaluation period was considered to begin a year after germination.

Ratings of windthrow hazard consider soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. For Toole County, soils on north slopes that remain moist into the spring and those having a high basal area that limits root development were considered moderately prone to windthrow, even though the soil materials provided a good anchoring medium for tree roots. On drier sites, clayey soils without rock fragments were also considered in this category. Soils that have a high water table within 20 inches of the surface long enough to inhibit root development were considered to be severely susceptible to windthrow.

Ratings of plant competition indicate the degree to which understory plants are expected to encroach and affect the establishment of tree seedlings on different kinds of soil when openings are made in the canopy. In making ratings for plant competition, the limitation

was considered slight if adequate regeneration usually occurs on a soil within five years.

Listed in the "Forest Land Productivity" table are the categories common trees and site index. Common trees refers to the trees most commonly encountered on the different soils. For the more common trees, particularly those of commercial value, site index values have been determined. Site index is a value that ranks soil productivity for a specified tree species. It is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The specified number of years (base age) may be different for different

species. The site index applies to fully stocked, even-aged, unmanaged stands of trees. The site index base age is 30 years for plains cottonwood and 100 years for lodgepole pine (Alexander, 1966). Since different base ages are used for different species, site index values are not directly comparable from one species to another. Board-foot volumes include all trees larger than 10 inches in diameter breast height, to an 8-inch top diameter inside bark (Meyers, 1966). Total cubic-foot volume estimates (inside bark) are based on all trees with diameter breast height inside the bark of more than 1 inch (Dahms, 1964).

## Forest Land Management

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that data were not available)

Map symbol and soil name	Ordi- nation symbol	Management concerns				
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition
861F: Stemple-----	3R	Severe	Severe	Moderate	Moderate	Moderate
862F: Stemple-----	4R	Severe	Severe	Moderate	Moderate	Moderate
871B: Nesda, cool-----	1W	Moderate	Slight	Severe	Slight	Severe

## Forest Land Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that data were not available)

Map symbol and soil name	Common trees	Site index	Produc- tivity class	Board feet	Cubic feet	Trees that stands are commonly managed for-
861F: Stemple-----	Lodgepole pine-----	40	3	-	-	Lodgepole pine
862F: Stemple-----	Douglas-fir-----	35	4	131	45	Lodgepole pine,
	Lodgepole pine-----	55	3	130	45	Douglas-fir
871B: Nesda, cool----	Black cottonwood-----	25	-	-	-	Narrowleaf cottonwood,
	Narrowleaf cottonwood---	25	-	-	-	Black cottonwood



## Main Forest Access Road Limitations and Hazards

(See text for a description of the Limitations and Hazards listed  
in this table)

Soil name and map symbol	Forest access road limitations or hazards
861F:	
Stemple-----	Areas of rubble land Low soil strength Slope
Rubble land-----	Nonsoil material
862F:	
Stemple-----	Areas of rubble land Low soil strength Slope
Rubble land-----	Nonsoil material
871B:	
Nesda-----	None
Nesda, cool-----	Flooding



## Recreation

---

The soils of the survey area are rated in the table "Recreational Development" according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

*Camp areas* are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

*Picnic areas* are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

*Playgrounds* are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an

adequate cover of vegetation. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

*Paths and trails* are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

*Golf fairways* are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

*Slight* means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

*Moderate* means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

*Severe* means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal

high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in the table "Recreational Development" can be supplemented by other

information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in the table "Building Site Development" and interpretations for septic tank absorption fields in the table "Sanitary Facilities."

## Recreational Development

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
2A: Riverwash.					
4B: Brockway-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
4C: Brockway-----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Slight.
12C: Tally-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
12D: Tally-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.	Moderate: slope.
13B: Tanna-----	Slight.	Slight.	Moderate: slope, depth to rock.	Severe: erodes easily.	Moderate: depth to rock.
13C: Tanna-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Moderate: depth to rock.
14A: McKenzie-----	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
15F: Lambeth-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
16B: Degrand-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
19B: Kenilworth-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
20C: Cabba-----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: depth to rock.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
20D: Cabba-----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: depth to rock.
22E: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
22F: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
23A: Acel-----	Slight.	Slight.	Slight.	Slight.	Slight.
26B: Absher-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium, too clayey.
27B: Attewan-----	Slight.	Slight.	Moderate: slope, small stones.	Moderate: dusty.	Moderate: droughty.
28A: Nishon-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
29B: Nunemaker-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.	Slight.
29C: Nunemaker-----	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight.	Slight.
30B: Marvan-----	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
30C: Marvan-----	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
32B: Kobase-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
32C: Kobase-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
33B: Phillips-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
35B: Assinniboine----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
35C: Assinniboine----	Slight.	Slight.	Severe: slope.	Slight.	Slight.
36C: Chinook-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
37B: Evanston-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
37C: Evanston-----	Slight.	Slight.	Severe: slope.	Slight.	Slight.
38B: Kthridge-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
39B: Ferd-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
42B: Joplin-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
42C: Joplin-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
44B: Kevin-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
44C: Kevin-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
45C: Cozberg-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
45D: Cozberg-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.	Moderate: slope.
47B: Marias-----	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
48B: Vanda-----	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Severe: erodes easily.	Severe: excess salt, too clayey.
48C: Vanda-----	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Severe: erodes easily.	Severe: excess salt, too clayey.
49C: Floweres-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
50B: Telstad-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
51B: Turner-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones, droughty.
53D: Sunburst-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
53E: Sunburst-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
53F: Sunburst-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
54B: Trudau-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Moderate: droughty.
58B: Lonna-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
59B: Hedstrom-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
60A: Havre-----	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
62A: Vaeda-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones.	Slight.	Moderate: droughty.



## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
64B: Nobe-----	Moderate: percs slowly, too clayey.	Moderate: too clayey, excess salt.	Moderate: slope, too clayey.	Severe: erodes easily.	Severe: too clayey.
67B: Bearpaw-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
68B: Gerber-----	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Slight.	Severe: too clayey.
69A: Vida-----	Slight.	Slight.	Moderate: small stones.	Severe: erodes easily.	Moderate: large stones
69C: Vida-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones
71F: Roy-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
72F: Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
73D: Yetull-----	Slight.	Slight.	Severe: slope.	Slight.	Moderate: droughty.
74B: Shambo-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
75B: Farnuf-----	Slight.	Slight.	Moderate: small stones.	Slight.	Slight.
75C: Farnuf-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
77C: Tinsley-----	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.	Severe: droughty.
77E: Tinsley-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
79B: Yamacall-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Severe: erodes easily.	Slight.
79C: Yamacall-----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Slight.
79D: Yamacall-----	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
80B: Williams-----	Slight.	Slight.	Moderate: small stones.	Slight.	Slight.
80C: Williams-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
82B: Savage-----	Slight.	Slight.	Slight.	Severe: erodes easily.	Slight.
85B: Benz-----	Moderate: excess salt.	Moderate: excess salt.	Moderate: slope, excess salt.	Severe: erodes easily.	Moderate: excess salt.
88C: Perma-----	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.	Moderate: small stones, large stones.
88E: Perma-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
90A: Harlake-----	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
94C: Busby-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
94D: Busby-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.	Moderate: slope.
96C: Macar-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
96D: Macar-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
98B: Kremlin-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
101A: Hanly-----	Severe: flooding.	Slight.	Slight.	Slight.	Moderate: droughty.
Glendive-----	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
Havre-----	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
110A: Korchea-----	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
Kiwanis-----	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
141A: McKenzie-----	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, excess salt.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: excess salt, ponding, too clayey.
143A: Meadowcreek-----	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
144A: Bigsandy-----	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
162B: Degrand-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
171F: Delpoint-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cabbart-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
181D: Doney-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.	Moderate: slope, depth to rock.
Cabba-----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: depth to rock.
191B: Kenilworth-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
200F: Badland.					
201F: Cabba-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop, mudstone.					
202F: Cabba-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Dast-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
203E: Cabba-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
Doney-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
211F: Cabbart-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop.					
212F: Cabbart-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
213E: Cabbart-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, depth to rock.
Delpoint-----	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
221E: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Kevin-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
222E: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
222E: Neldore-----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.	Severe: depth to rock, too clayey.
222F: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Neldore-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock, too clayey.
224E: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Joplin-----	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
241C: Marmarth-----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Moderate: depth to rock.
Evanston-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
251C: Bascovy-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: depth to rock.
252D: Bascovy-----	Moderate: slope, percs slowly.	Moderate: slope, too clayey.	Severe: slope.	Severe: erodes easily.	Severe: too clayey.
Neldore-----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.	Severe: depth to rock, too clayey.
261A: Absher-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium, too clayey.
Nobe-----	Moderate: percs slowly.	Moderate: excess salt.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: excess salt, droughty.
272B: Attewan-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: droughty.
300F: Rubble land.					

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
311B:					
Creed-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
Gerdum-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
Absher-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium, too clayey.
321B:					
Kobase-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
321C:					
Kobase-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
323C:					
Sagedale-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
331B:					
Phillips-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Elloam-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
332B:					
Phillips-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Kevin-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
364C:					
Chinook-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
372B:					
Evanston-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
373C:					
Evanston-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Tinsley-----	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.	Severe: droughty.
374B:					
Evanston-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
374C: Evanston-----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Slight.
378B: Evanston-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Evanston, calcareous-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
379C: Evanston-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Busby-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
384B: Ethridge-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
386B: Ethridge-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
Evanston-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
391B: Ferd-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
Creed-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
Gerdrum-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
391C: Ferd-----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.	Slight.
Creed-----	Severe: excess sodium.	Severe: excess sodium.	Severe: slope, excess sodium.	Severe: erodes easily.	Severe: excess sodium.
Gerdrum-----	Severe: excess sodium.	Severe: excess sodium.	Severe: slope, excess sodium.	Severe: erodes easily.	Severe: excess sodium.
402A: Gerdrum-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
Absher-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium, too clayey.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
411B:					
Reeder-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Cabba-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.	Severe: depth to rock.
411C:					
Reeder-----	Slight.	Slight.	Severe: slope.	Slight.	Slight.
Cabba-----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.	Severe: depth to rock.
421C:					
Joplin-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
Hillon-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
421D:					
Joplin-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Hillon-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
423B:					
Joplin, calcareous----	Slight.	Slight.	Slight.	Severe: erodes easily.	Slight.
Hillon-----	Slight.	Slight.	Moderate: small stones.	Severe: erodes easily.	Slight.
423C:					
Hillon-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Joplin, calcareous----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
424C:					
Joplin-----	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: dusty.	Moderate: small stones.
Hillon-----	Slight.	Slight.	Severe: small stones.	Slight.	Slight.
425C:					
Joplin, calcareous----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
Telstad-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.



## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
426B: Joplin-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
427B: Joplin-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
Joplin, calcareous----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
427C: Joplin-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
Joplin, calcareous----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
441C: Kevin-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Hillon-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
443B: Kevin-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Ferd-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
444B: Kevin, calcareous----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Ferd-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
445B: Kevin-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Kevin, calcareous----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
445C: Kevin, calcareous----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
445C: Kevin-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
446C: Kevin-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Elloam-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
451A: Cozberg-----	Slight.	Slight.	Slight.	Slight.	Slight.
Lihen-----	Slight.	Slight.	Moderate: small stones.	Slight.	Moderate: droughty.
451C: Cozberg-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Lihen-----	Slight.	Slight.	Moderate: slope.	Slight.	Moderate: droughty.
481A: Bigsag-----	Severe: flooding, wetness, percs slowly.	Severe: too clayey, excess sodium, excess salt.	Severe: too clayey, wetness, percs slowly.	Severe: too clayey.	Severe: excess salt, excess sodium, too clayey.
482A: Vanda-----	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Severe: erodes easily.	Severe: excess salt, too clayey.
Marvan-----	Moderate: percs slowly, too clayey, excess salt.	Moderate: too clayey, excess salt, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
503B: Telstad-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Joplin-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
503C: Telstad-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
Joplin-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
504B: Telstad-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
504B: Joplin-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
504C: Telstad-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
Joplin-----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Slight.
511C: Turner-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Moderate: large stones, droughty.
521B: Elloam-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
Absher-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Severe: erodes easily.	Severe: excess sodium.
551E: Lihen-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Blanchard-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
561B: Scobey-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Kevin-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
561C: Scobey-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
Kevin-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Slight.
561D: Scobey-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Kevin-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
563B: Scobey, calcareous-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
571A:					
Ryell-----	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
Rivra-----	Severe: flooding, wetness.	Severe: wetness.	Severe: small stones, wetness.	Severe: wetness.	Severe: wetness, droughty.
572A:					
Ryell-----	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
Havre-----	Severe: flooding.	Moderate: dusty.	Moderate: flooding.	Moderate: dusty.	Moderate: flooding.
581B:					
Lonna-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
581C:					
Lonna-----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Slight.
582B:					
Lonna-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
Ethridge-----	Slight.	Slight.	Moderate: slope.	Severe: erodes easily.	Slight.
601A:					
Havre-----	Severe: flooding.	Moderate: dusty.	Slight.	Moderate: dusty.	Slight.
Glendive-----	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
603A:					
Havre-----	Severe: flooding.	Moderate: dusty.	Moderate: flooding.	Moderate: dusty.	Moderate: flooding.
Glendive-----	Severe: flooding.	Slight.	Moderate: flooding.	Slight.	Moderate: flooding.
651E:					
Fleak-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
Lihen-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
673B:					
Bearpaw-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
673B: Daglum-----	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.	Severe: excess sodium.
691B: Vida-----	Slight.	Slight.	Moderate: small stones.	Severe: erodes easily.	Moderate: large stones.
Vida, calcareous-----	Slight.	Slight.	Moderate: small stones.	Severe: erodes easily.	Moderate: large stones.
Williams-----	Slight.	Slight.	Moderate: small stones.	Slight.	Slight.
691C: Vida-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones.
Vida, calcareous-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones.
Williams-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
692D: Vida, calcareous-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Moderate: large stones.
Williams-----	Slight.	Slight.	Severe: slope.	Slight.	Slight.
Zahill-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
694C: Vida-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones.
Williams-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
695D: Vida-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Moderate: large stones.
Williams-----	Slight.	Slight.	Severe: slope.	Slight.	Slight.
Zahill-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
696E:					
Vida-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
697C:					
Vida-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones.
Bearpaw-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
698D:					
Vida-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, slope.
Bearpaw-----	Slight.	Slight.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
Nishon-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
698E:					
Vida-----	Slight.	Slight.	Severe: slope.	Severe: erodes easily.	Moderate: large stones.
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Nishon-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
721E:					
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Zahl-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
721F:					
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Zahl-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
722F:					
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Dast-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
722F:					
Cabba-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
743A:					
Shambo-----	Slight.	Slight.	Slight.	Severe: erodes easily.	Slight.
Fairway-----	Severe: flooding.	Slight.	Slight.	Slight.	Slight.
761B:					
Fairway-----	Severe: flooding.	Slight.	Moderate: slope.	Slight.	Slight.
Bigsandy-----	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
793B:					
Yamacall-----	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Severe: erodes easily.	Slight.
793C:					
Yamacall-----	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.	Slight.
793D:					
Yamacall-----	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
831B:					
Enbar-----	Severe: flooding.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
Bigsandy-----	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Korchea-----	Severe: flooding.	Slight.	Moderate: slope.	Slight.	Slight.
861F:					
Stemple-----	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
Rubble land.					
862F:					
Stemple-----	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
Rubble land.					

## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
871B:					
Nesda-----	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight.	Moderate: small stones, droughty.
Nesda, cool----	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
881E:					
Perma-----	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: slope.
Whitlash-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: slope, depth to rock.
881F:					
Perma-----	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Whitlash-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope, depth to rock.
942C:					
Busby-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
Chinook-----	Slight.	Slight.	Moderate: slope, small stones.	Slight.	Slight.
961B:					
Macar-----	Slight.	Slight.	Moderate: slope.	Slight.	Slight.
971C:					
Neldore-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.	Severe: depth to rock, too clayey.
Bascovy-----	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Severe: too clayey.
971F:					
Neldore-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock, too clayey.
Bascovy-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope, too clayey.



## Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
972F:					
Neldore-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock, too clayey.
Lambeth-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Rock outcrop.					
DA: Denied access.					
M-W: Miscellaneous water.					
W: Water.					



# Wildlife Habitat

---

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. If food, cover, or water is missing, inadequate, or inaccessible, wildlife will be scarce or will not inhabit the area.

If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

## Elements of Wildlife Habitat

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples are wheat, rye, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples are fescue, brome grass, timothy, orchardgrass, clover, alfalfa, trefoil, reed canarygrass, and crownvetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestem, indiagrass, blueberry, goldenrod, lambsquarters, dandelions, blackberry, ragweed, wheatgrass, fescue, and nightshade.

The major soil properties affecting the growth of grain and forage crops and wild herbaceous plants are depth of the root zone, texture of the surface layer, the amount of water available to plants, wetness, salinity or sodicity, and flooding. The length of the growing season also is important.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage that wildlife eat. Examples are oak, poplar, boxelder, birch, maple, green ash, willow, and American elm. Examples of fruit-producing shrubs that are suitable for planting on soils that have good potential for these plants are hawthorn, honeysuckle, American plum, redosier dogwood, chokecherry, serviceberry, silver buffaloberry, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that provide habitat or supply food in the form of browse, seed, or fruitlike cones. Examples are pine, spruce, hemlock, fir, yew, cedar, larch, and juniper.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are depth of root zone, the amount of water available to plants, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of these plants are smartweed, wild millet, rushes, sedges, bulrushes, wild rice, arrowhead, waterplantain, pickerelweed, and cattail.

The major soil properties affecting wetland plants are texture of the surface layer, wetness, acidity or alkalinity, and slope.

Shallow water areas have an average depth of less than 5 feet. They are useful as habitat for some wildlife species. They are naturally wet areas or are created by dams, levees, or water-control measures in marshes or streams. Examples are muskrat marshes, waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

The major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

## Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, pheasant, sharp-tailed grouse, sage grouse, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of hardwoods or conifers or a mixture of these and associated grasses, legumes, and wild herbaceous plants. The wildlife attracted to this habitat include wild turkey, ruffed grouse, thrushes, woodpeckers, owls,

tree squirrels, porcupine, raccoon, deer, elk, and black bear.

Habitat for wetland wildlife consists of open, marshy or swampy, shallow water areas that support water-tolerant plants. The wildlife attracted to this habitat include ducks, geese, herons, bitterns, rails, kingfishers, muskrat, otter, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. The wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

### **Wildlife Habitat in Toole County**

Most of the glaciated uplands soils in this county are under intense cultivation. They contain nesting areas and woody cover which generally are on small acreages along streams and coulees. These areas also occur near farmsteads, along road ditches, and in field windbreaks. Wildlife populations of most species are lower in these cultivated areas. A few game birds, such as the Hungarian partridge and sharptailed grouse, find cover and food along ditches, fence rows, coulees, or field windbreaks. Land management practices beneficial to Hungarian partridge and sharptailed grouse include proper grazing use of rangelands to ensure that sufficient plant residue is retained to provide cover for nesting, roosting, and brood rearing. The protection of brushy draws and fence rows, and the establishment of shelterbelts, are also important practices.

White-tailed and mule deer are found throughout Toole County. White-tails generally inhabit the bottomlands of the Marias River and its tributaries, as well as other stream bottoms and lower foothills adjacent to farmlands. Mule deer are found over much of the foot slopes of the Sweetgrass Hills. They are also in brushy bottoms and broken rangelands of the county.

Pronghorn antelope are found mainly east of Shelby and north of Kevin; however, pronghorn may be found scattered throughout the county. The potential for maintaining pronghorn herds is largely dependent on the proper management of rangelands. If ranges are overgrazed, competition for food between domestic livestock and pronghorns can be

serious. There is little competition on well-managed range. Pronghorns utilize forbs and browse what cattle seldom eat, unless forced to do so because of overgrazing.

Rocky Mountain elk are found in the Sweetgrass Hills in the extreme northeastern portion of Toole County. Elk spend their summers and falls at relatively high elevations, where dense forests intersperse with grassy mountain meadows. Movement to lower elevations begins in mid- to late fall, depending on snowfall. Winter ranges usually consist of south-facing foot slopes and low foothills.

Ring-necked pheasants are found mainly along the Marias River in the southern part of the county, and along Miners Coulee west of Oilmont. Land management practices that are beneficial to pheasants include proper grazing, protection of woody cover from burning or eradication, and the retention of stubble and waste grain in winter through the elimination of fall tillage. Woody plantings in the form of shelterbelts or windbreaks are beneficial to pheasants and other game and nongame species.

Sage grouse inhabit sagebrush-covered rangelands, mainly in the northern part of the county. Optimum sage grouse habitat is characterized by communities of big sagebrush and silver sagebrush, with a variety of forbs and grasses and the environmental factors associated with such plant communities.

Migratory waterfowl such as ducks, geese, swans, and other shore birds can be found on the Marias River, Lake Elwell, Lake Shell-oole, and many ponds and reservoirs throughout the county. These areas provide suitable habitat for waterfowl during spring and fall migrations, as well as during the nesting seasons.

Beaver, raccoon, and mink inhabit areas along Willow Creek and the Marias River. Cottontail rabbits, badgers, ground squirrels, coyotes, jackrabbits, and other small mammals are common in most of Toole County.

Public fishing is popular in the Marias River and in Lake Elwell. The most commonly sought fish are trout, walleye, northern pike, sauger, and perch. Other ponds or reservoirs with populations of trout are Lake Shell-oole, Cameron Lake, and Henry's Pond.

# Engineering

---

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*

*The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

## Building Site Development

The table "Building Site Development" shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

*Dwellings and small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the

amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

## Sanitary Facilities

The table "Sanitary Facilities" shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight*, *moderate*, or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good*, *fair*, and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

*Septic tank absorption fields* are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field

to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

The table "Sanitary Facilities" gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

*Trench sanitary landfill* is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

*Area sanitary landfill* is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. The ratings in the table "Sanitary Facilities" are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

*Daily cover for landfill* is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

## Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a



minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

## Construction Materials

The table "Construction Materials" gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In the table "Construction Materials," the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of

15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

*Sand* and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table "Construction Materials," only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have



only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

## Water Management

The table "Water Management" gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In the table "Water Management," the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Aquifer-fed excavated ponds* are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

*Drainage* is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

*Irrigation* is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve

moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

*Grassed waterways* are natural or constructed channels, generally broad and shallow, that conduct

surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

## Building Site Development

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
2A: Riverwash.						
4B: Brockway-----	Slight.	Slight.	Slight.	Slight.	Severe: low strength.	Slight.
4C: Brockway-----	Slight.	Slight.	Slight.	Moderate: slope.	Severe: low strength.	Slight.
12C: Tally-----	Severe: cutbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
12D: Tally-----	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
13B: Tanna-----	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: depth to rock.
13C: Tanna-----	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: depth to rock.
14A: McKenzie-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding, too clayey.
15F: Lambeth-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
16B: Degrand-----	Severe: cutbanks cave.	Slight.	Slight.	Slight.	Moderate: frost action.	Slight.
19B: Kenilworth-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
20C: Cabba-----	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
20D: Cabba-----	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, shrink-swell, slope.	Severe: depth to rock.
22E: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
22F: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
23A: Acel-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
26B: Absher-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium, too clayey.
27B: Attewan-----	Severe: cutbanks cave.	Slight.	Slight.	Slight.	Moderate: frost action.	Moderate: droughty.
28A: Nishon-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
29B: Nunemaker-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
29C: Nunemaker-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
30B: Marvan-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
30C: Marvan-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
32B: Kobase-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
32C: Kobase-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
33B: Phillips-----	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
35B: Assinniboine----	Severe: outbanks cave.	Slight.	Slight.	Slight.	Moderate: frost action.	Slight.
35C: Assinniboine----	Severe: outbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
36C: Chinook-----	Severe: outbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
37B: Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
37C: Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
38B: Ethridge-----	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
39B: Ferd-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
42B: Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
42C: Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
44B: Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
44C: Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
45C: Cozberg-----	Severe: cutbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
45D: Cozberg-----	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
47B: Marias-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
48B: Vanda-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess salt, too clayey.
48C: Vanda-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess salt, too clayey.
49C: Floweree-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
50B: Telstad-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
51B: Turner-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Moderate: large stones, droughty.
53D: Sunburst-----	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
53E: Sunburst-----	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
53F: Sunburst-----	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
54B: Trudau-----	Slight.	Moderate: shrink-swell.	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: droughty.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
58B: Lonna-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
59B: Hedstrom-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
60A: Havre-----	Slight.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
62A: Vaeda-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
64B: Nobe-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
67B: Bearpaw-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
68B: Gerber-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
69A: Vida-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: large stones.
69C: Vida-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: large stones.
71F: Roy-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
72F: Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
73D: Yetull-----	Severe: cutbanks cave.	Slight.	Slight.	Moderate: slope.	Slight.	Moderate: droughty.
74B: Shambo-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
75B: Farnuf-----	Slight.	Slight.	Slight.	Slight.	Moderate: frost action.	Slight.
75C: Farnuf-----	Slight.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
77C: Tinsley-----	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.	Severe: droughty.
77E: Tinsley-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
79B: Yamacall-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
79C: Yamacall-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
79D: Yamacall-----	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: slope.
80B: Williams-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
80C: Williams-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
82B: Savage-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
85B: Benz-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: excess salt.
88C: Perma-----	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: small stones, large stones.
88E: Perma-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.



## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
90A: Harlake-----	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Slight.
94C: Busby-----	Severe: cutbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
94D: Busby-----	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
96C: Macar-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
96D: Macar-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope.
98B: Kremlin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
101A: Hanly-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
Glendive-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Havre-----	Slight.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
110A: Korchea-----	Slight.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Kiwanis-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
141A: McKenzie-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: excess salt, ponding, too clayey.
143A: Meadowcreek----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: frost action.	Slight.

### Building Site Development--Continued

[illegible]

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
211F:						
Cabbart-----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop.						
212F:						
Cabbart-----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
213E:						
Cabbart-----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Delpoint-----	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope, depth to rock.
221E:						
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Kevin-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
222E:						
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Neldore-----	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: depth to rock, too clayey.
222F:						
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Neldore-----	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, depth to rock, too clayey.
224E:						
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
224E: Joplin-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: slope.
241C: Marmarth-----	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: depth to rock.
Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
251C: Bascovy-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: depth to rock.
252D: Bascovy-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: too clayey.
Neldore-----	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: depth to rock, too clayey.
261A: Absher-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium, too clayey.
Nobe-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: excess salt, droughty.
272B: Attewan-----	Severe: cutbanks cave.	Slight.	Slight.	Slight.	Moderate: frost action.	Moderate: droughty.
300F: Rubble land.						
311B: Creed-----	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
Gardrum-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
Absher-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium, too clayey.
321B: Kobase-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
321C: Kobase-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
323C: Sagedale-----	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
331B: Phillips-----	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Elloam-----	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
332B: Phillips-----	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
364C: Chinook-----	Severe: cutbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
372B: Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
373C: Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
Tinsley-----	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.	Severe: droughty.
374B: Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
374C: Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
378B: Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
Evanston, calcareous----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
379C: Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
Busby-----	Severe: cutbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
384B: Ethridge-----	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
386B: Ethridge-----	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Evanston-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
391B: Ferd-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Creed-----	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
Gerdrum-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
391C: Ferd-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Creed-----	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: excess sodium.
Gerdrum-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
402A: Gerdrum-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
Absher-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium, too clayey.
411B: Reeder-----	Slight.	Slight.	Slight.	Slight.	Moderate: frost action.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
411B: Cabba-----	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.
411C: Reeder-----	Slight.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
Cabba-----	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.
421C: Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
Hillon-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
421D: Joplin-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: slope.
Hillon-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
423B: Joplin, calcareous----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
Hillon-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
423C: Hillon-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Joplin, calcareous----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
424C: Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: small stones.
Hillon-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
425C: Joplin, calcareous-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
Telstad-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
426B: Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
427B: Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
Joplin, calcareous-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
427C: Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
Joplin, calcareous-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
441C: Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Hillon-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
443B: Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Ferd-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
444B: Kevin, calcareous-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Ferd-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.



## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
445B:						
Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Kevin, calcareous----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
445C:						
Kevin, calcareous----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
446C:						
Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Elloam-----	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: excess sodium.
451A:						
Cozberg-----	Severe: outbanks cave.	Slight.	Slight.	Slight.	Moderate: frost action.	Slight.
Lihea-----	Severe: outbanks cave.	Slight.	Slight.	Slight.	Slight.	Moderate: droughty.
451C:						
Cozberg-----	Severe: outbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
Lihea-----	Severe: outbanks cave.	Slight.	Slight.	Moderate: slope.	Slight.	Moderate: droughty.
481A:						
Bigsag-----	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess salt, excess sodium, too clayey.
482A:						
Vanda-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess salt, too clayey.
Marvan-----	Severe: outbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
503B:						
Telstad-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
503B: Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
503C: Telstad-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
504B: Telstad-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
504C: Telstad-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
Joplin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
511C: Turner-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Moderate: large stones, droughty.
521B: Elloam-----	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: excess sodium.
Absher-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
551E: Lihen-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Blanchard-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
561B: Scobey-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
561C: Scobey-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Kevin-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
561D: Scobey-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Kevin-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
563B: Scobey, calcareous----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
571A: Ryell-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Rivra-----	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, droughty.
572A: Ryell-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Havre-----	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
581B: Lonna-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
581C: Lonna-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
582B: Lonna-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Ethridge-----	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
601A: Havre-----	Slight.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
601A: Glendive-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
603A: Havre-----	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Glendive-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
651E: Fleak-----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Lihen-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
673B: Bearpaw-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Daglum-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
691B: Vida-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Vida, calcareous----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Williams-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
691C: Vida-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Vida, calcareous----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Williams-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
692D: Vida, calcareous-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Williams-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
Zahill-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: large stones, slope.
694C: Vida-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Williams-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
695D: Vida-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Williams-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
Zahill-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: large stones, slope.
696E: Vida-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: large stones, slope.
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
697C: Vida-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Bearpaw-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
698D: Vida-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: large stones, slope.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
698D:						
Bearpaw-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Nishon-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
698E:						
Vida-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: large stones.
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Nishon-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
721E:						
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Zahl-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
721F:						
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Zahl-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
722F:						
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Dast-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cabba-----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
743A:						
Shambo-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
Fairway-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: frost action.	Slight.
761B:						
Fairway-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: frost action.	Slight.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
761B: Bigsandy-----	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
793B: Yamacall-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
793C: Yamacall-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.	Slight.
793D: Yamacall-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, slope, frost action.	Moderate: slope.
831B: Enbar-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: frost action.	Slight.
Bigsandy-----	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Korchea-----	Slight.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
861F: Stemple-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Rubble land.						
862F: Stemple-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Rubble land.						
871B: Nesda-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: small stones, droughty.
Nesda, cool----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: small stones.
881E: Perma-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
881E: Whitlash-----	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock.
881F: Perma-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Whitlash-----	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock.
942C: Busby-----	Severe: cutbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
Chinook-----	Severe: cutbanks cave.	Slight.	Slight.	Moderate: slope.	Moderate: frost action.	Slight.
961B: Macar-----	Slight.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
971C: Neldore-----	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: depth to rock, too clayey.
Basconvy-----	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
971F: Neldore-----	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, depth to rock, too clayey.
Basconvy-----	Severe: cutbanks cave, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, too clayey.
972F: Neldore-----	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, depth to rock, too clayey.
Lambeth-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Rock outcrop.						



## Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
DA: Denied access.						
M-W: Miscellaneous water.						
W: Water.						

## Sanitary Facilities

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
2A: Riverwash.					
4B: Brockway-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
4C: Brockway-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
12C: Tally-----	Slight.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
12D: Tally-----	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, slope.
13B: Tanna-----	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Slight.	Poor: depth to rock.
13C: Tanna-----	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Slight.	Poor: depth to rock.
14A: McKenzie-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
15F: Lambeth-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
16B: Degrand-----	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight.	Poor: seepage, too sandy.
19B: Kenilworth-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
20C: Cabba-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
20D: Cabba-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
22E: Hillon-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
22F: Hillon-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
23A: Acel-----	Severe: percs slowly.	Slight.	Severe: too clayey.	Slight.	Poor: too clayey
26B: Absher-----	Severe: percs slowly.	Moderate: slope.	Severe: excess salt.	Slight.	Poor: hard to pack.
27B: Attewan-----	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight.	Poor: seepage, too sandy, small stones.
28A: Nishon-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
29B: Nunemaker-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Poor: hard to pack.
29C: Nunemaker-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Poor: hard to pack.
30B: Marvan-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.
30C: Marvan-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.
32B: Kobase-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
32C: Kobase-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
33B: Phillips-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
35B: Assinniboine----	Moderate: percs slowly.	Severe: seepage.	Slight.	Slight.	Fair: thin layer.
35C: Assinniboine----	Moderate: percs slowly.	Severe: seepage.	Slight.	Slight.	Fair: thin layer.
36C: Chinook-----	Slight.	Severe: seepage.	Slight.	Slight.	Good.
37B: Evanston-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
37C: Evanston-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
38B: Ethridge-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
39B: Ferd-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
42B: Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
42C: Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
44B: Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
44C: Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
45C: Cozberg-----	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight.	Poor: seepage, too sandy.
45D: Cozberg-----	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy.
47B: Marias-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
48B: Vanda-----	Severe: percs slowly.	Moderate: slope.	Severe: excess salt.	Slight.	Poor: hard to pack.
48C: Vanda-----	Severe: percs slowly.	Moderate: slope.	Severe: excess salt.	Slight.	Poor: hard to pack.
49C: Floweree-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
50B: Telstad-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
51B: Turner-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
53D: Sunburst-----	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
53E: Sunburst-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
53F: Sunburst-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
54B: Trudau-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
58B: Lonna-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
59B: Hedstrom-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
60A: Havre-----	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
62A: Vaeda-----	Severe: percs slowly.	Slight.	Slight.	Slight.	Poor: hard to pack.
64B: Nobe-----	Severe: percs slowly.	Moderate: slope.	Severe: excess salt.	Slight.	Poor: hard to pack.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
67B: Bearpaw-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.
68B: Gerber-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.
69A: Vida-----	Severe: percs slowly.	Slight.	Moderate: too clayey.	Slight.	Fair: too clayey.
69C: Vida-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight.	Fair: too clayey.
71F: Roy-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
72F: Zahill-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
73D: Yetull-----	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Slight.	Poor: seepage, too sandy.
74B: Shambo-----	Moderate: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Slight.	Fair: too clayey.
75B: Farnuf-----	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
75C: Farnuf-----	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
77C: Tinsley-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
77E: Tinsley-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
79B: Yamacall-----	Moderate: percs slowly.	Severe: seepage.	Slight.	Slight.	Good.
79C: Yamacall-----	Moderate: percs slowly.	Severe: seepage.	Slight.	Slight.	Good.
79D: Yamacall-----	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
80B: Williams-----	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
80C: Williams-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
82B: Savage-----	Severe: percs slowly.	Slight.	Severe: too clayey.	Slight.	Poor: too clayey.
85B: Benz-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
88C: Perma-----	Moderate: percs slowly, large stones.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
88E: Perma-----	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
90A: Harlake-----	Severe: percs slowly.	Slight.	Moderate: flooding.	Moderate: flooding.	Poor: hard to pack.
94C: Busby-----	Slight.	Severe: seepage.	Slight.	Slight.	Good.
94D: Busby-----	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
96C: Macar-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
96D:					
Macar-----	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
98B:					
Kremlin-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
101A:					
Hanly-----	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Moderate: flooding.	Poor: seepage, too sandy.
Glendive-----	Moderate: flooding.	Severe: seepage.	Moderate: flooding, too sandy.	Moderate: flooding.	Fair: too sandy.
Havre-----	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
110A:					
Korchea-----	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
Kiwanis-----	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
141A:					
McKenzie-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
143A:					
Meadowcreek-----	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
144A:					
Bigsandy-----	Severe: wetness, percs slowly.	Slight.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, too sandy, wetness.
162B:					
Degrand-----	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight.	Poor: seepage, too sandy.
171F:					
Delpoint-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Cabbart-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.



## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
181D:					
Doney-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Cabba-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
191B:					
Kenilworth-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
200F:					
Badland.					
201F:					
Cabba-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop, mudstone.					
202F:					
Cabba-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Dast-----	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
203E:					
Cabba-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Doney-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
211F:					
Cabbart-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Rock outcrop.					
212F:					
Cabbart-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Hillon-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
213E:					
Cabbart-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Delpoint-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
221E:					
Millon-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Kevin-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
222E:					
Millon-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Neldore-----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock, hard to pack.
Gerdum-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Poor: hard to pack.
391C:					
Ferd-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Creed-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Gerdum-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Poor: hard to pack.
402A:					
Gerdum-----	Severe: percs slowly.	Moderate: seepage.	Slight.	Slight.	Poor: hard to pack.
Absher-----	Severe: percs slowly.	Slight.	Severe: excess salt.	Slight.	Poor: hard to pack.
411B:					
Reeder-----	Severe: percs slowly.	Severe: seepage.	Slight.	Slight.	Poor: thin layer.
Cabba-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
411C:					
Reeder-----	Severe: percs slowly.	Severe: seepage.	Slight.	Slight.	Poor: thin layer.
Cabba-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
421C:					
Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
Hillon-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
421D:					
Joplin-----	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
Hillon-----	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
423B:					
Joplin, calcareous----	Severe: percs slowly.	Moderate: seepage.	Slight.	Slight.	Fair: small stones.
Hillon-----	Severe: percs slowly.	Slight.	Slight.	Slight.	Good.
423C:					
Hillon-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Joplin, calcareous----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
424C:					
Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
Hillon-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
425C:					
Joplin, calcareous----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
Telstad-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
426B:					
Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
427B:					
Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
427B: Joplin, calcareous-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
427C: Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
Joplin, calcareous-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
441C: Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Hillon-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
443B: Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Ferd-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
444B: Kevin, calcareous-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Ferd-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
445B: Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Kevin, calcareous-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
445C: Kevin, calcareous-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
446C: Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Elloam-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
451A:					
Cozberg-----	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight.	Poor: seepage, too sandy.
Lihen-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
451C:					
Cozberg-----	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight.	Poor: seepage, too sandy.
Lihen-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
481A:					
Bigsag-----	Severe: wetness, percs slowly.	Slight.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
482A:					
Vanda-----	Severe: percs slowly.	Slight.	Severe: excess salt.	Slight.	Poor: hard to pack.
Marvan-----	Severe: percs slowly.	Slight.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.
503B:					
Telstad-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
503C:					
Telstad-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
504B:					
Telstad-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
504C:					
Telstad-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
504C: Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Fair: small stones.
511C: Turner-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
521B: Elloam-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
Absher-----	Severe: percs slowly.	Moderate: slope.	Severe: excess salt.	Slight.	Poor: hard to pack.
551E: Lihen-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope.
Blanchard-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope.
561B: Scobey-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Fair: small stones.
Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
561C: Scobey-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Fair: small stones.
Kevin-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
561D: Scobey-----	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: small stones, slope.
Kevin-----	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
563B: Scobey, calcareous----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Fair: small stones.
571A: Ryell-----	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, too sandy.	Severe: flooding.	Poor: seepage, too sandy, small stones.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
571A: Rivra-----	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding.	Severe: flooding, wetness, too sandy.	Severe: flooding, wetness.	Poor: seepage, too sandy, small stones.
572A: Ryell-----	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, too sandy.	Severe: flooding.	Poor: seepage, too sandy, small stones.
Havre-----	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
581B: Lonna-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
581C: Lonna-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
582B: Lonna-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
Ethridge-----	Severe: percs slowly.	Moderate: slope.	Slight.	Slight.	Good.
601A: Havre-----	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
Glendive-----	Moderate: flooding.	Severe: seepage.	Moderate: flooding, too sandy.	Moderate: flooding.	Fair: too sandy.
603A: Havre-----	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
Glendive-----	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding.	Severe: flooding.	Fair: too sandy.
651E: Fleak-----	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope, too sandy.	Severe: depth to rock, slope.	Poor: depth to rock, too sandy, slope.
Lihen-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
673B:					
Bearpaw-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.
Daglum-----	Severe: percs slowly.	Slight.	Severe: too clayey, excess sodium.	Slight.	Poor: too clayey, hard to pack, excess sodium.
691B:					
Vida-----	Severe: percs slowly.	Slight.	Moderate: too clayey.	Slight.	Fair: too clayey.
Vida, calcareous-----	Severe: percs slowly.	Slight.	Moderate: too clayey.	Slight.	Fair: too clayey.
Williams-----	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
691C:					
Vida-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight.	Fair: too clayey.
Vida, calcareous-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight.	Fair: too clayey.
Williams-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
692D:					
Vida, calcareous-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight.	Fair: too clayey.
Williams-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
Zahill-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
694C:					
Vida-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight.	Fair: too clayey.
Williams-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
695D:					
Vida-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight.	Fair: too clayey.



## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
695D:					
Williams-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight.	Fair: too clayey, small stones.
Zahill-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
696E:					
Vida-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Zahill-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
697C:					
Vida-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight.	Fair: too clayey.
Bearpaw-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.
698D:					
Vida-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Bearpaw-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight.	Poor: too clayey, hard to pack.
Nishon-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
698E:					
Vida-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight.	Fair: too clayey.
Zahill-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Nishon-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
721E:					
Zahill-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
721E:					
Zahl-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
721F:					
Zahill-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Zahl-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
722F:					
Zahill-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Dast-----	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
Cabba-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
743A:					
Shambo-----	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight.	Fair: too clayey.
Fairway-----	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: thin layer.
761B:					
Fairway-----	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: thin layer.
Bigsandy-----	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, too sandy, wetness.
793B:					
Yamacall-----	Moderate: percs slowly.	Severe: seepage.	Slight.	Slight.	Good.
793C:					
Yamacall-----	Moderate: percs slowly.	Severe: seepage.	Slight.	Slight.	Good.
793D:					
Yamacall-----	Moderate: percs slowly, slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
831B:					
Enbar-----	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: wetness.	Fair: wetness, thin layer.
Big sandy-----	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, too sandy, wetness.
Korchea-----	Moderate: flooding, percs slowly.	Moderate: seepage, slope.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
861F:					
Stemple-----	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
Rubble land.					
862F:					
Stemple-----	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
Rubble land.					
871B:					
Nesda-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Nesda, cool----	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy, small stones.
881E:					
Perma-----	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
Whitlash-----	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, large stones, slope.
881F:					
Perma-----	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
Whitlash-----	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, large stones, slope.

## Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
942C:					
Busby-----	Slight.	Severe: seepage.	Slight.	Slight.	Good.
Chinook-----	Slight.	Severe: seepage.	Slight.	Slight.	Good.
961B:					
Macar-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight.	Slight.	Good.
971C:					
Neldore-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.	Poor: depth to rock, hard to pack.
Bascovy-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
971F:					
Neldore-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
Bascovy-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
972F:					
Neldore-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
Lambeth-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Rock outcrop.					
DA:					
Denied access.					
M-W:					
Miscellaneous water.					
W:					
Water.					

## Construction Materials

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
2A: Riverwash.				
4B: Brockway-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
4C: Brockway-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
12C: Tally-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
12D: Tally-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
13B: Tanna-----	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
13C: Tanna-----	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
14A: McKenzie-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
15F: Lambeth-----	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
16B: Degrand-----	Good.	Probable.	Probable.	Poor: small stones.
19B: Kenilworth-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
20C: Cabba-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
20D: Cabba-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
22E: Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
22F: Hillon-----	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
23A: Acel-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
26B: Absher-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
27B: Attewan-----	Good.	Probable.	Probable.	Poor: too sandy, small stones, area reclaim.
28A: Nishon-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
29B: Nunemaker-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
29C: Nunemaker-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
30B: Marvan-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
30C: Marvan-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
32B: Kobase-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
32C: Kobase-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
33B: Phillips-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
35B: Assinniboine----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
35C: Assinniboine----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
36C: Chinook-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
37B: Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
37C: Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
38B: Ethridge-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
39B: Ferd-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
42B: Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
42C: Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
44B: Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
44C: Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
45C: Cozberg-----	Good.	Probable.	Probable.	Poor: small stones.
45D: Cozberg-----	Good.	Probable.	Probable.	Poor: small stones.
47B: Marias-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
48B: Vanda-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
48C: Vanda-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
49C: Floweree-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
50B: Telstad-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
51B: Turner-----	Good.	Probable.	Probable.	Poor: small stones, area reclaim.
53D: Sunburst-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
53E: Sunburst-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
53F: Sunburst-----	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
54B: Trudau-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
58B: Lonna-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
59B: Hedstrom-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, thin layer.
60A: Havre-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.



## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
62A: Vaeda-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
64B: Nobe-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
67B: Bearpaw-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
68B: Gerber-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
69A: Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
69C: Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
71F: Roy-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
72F: Zahill-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
73D: Yetull-----	Good.	Probable.	Improbable: too sandy.	Poor: too sandy.
74B: Shambo-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
75B: Farnuf-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
75C: Farnuf-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
77C: Tinsley-----	Fair: large stones.	Probable.	Probable.	Poor: too sandy, small stones, area reclaim.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
77E: Tinsley-----	Fair: large stones, slope.	Probable.	Probable.	Poor: too sandy, small stones, area reclaim.
79B: Yamacall-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
79C: Yamacall-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
79D: Yamacall-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
80B: Williams-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
80C: Williams-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
82B: Savage-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
85B: Benz-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
88C: Perma-----	Fair: large stones.	Improbable: small stones.	Probable.	Poor: small stones, area reclaim.
88E: Perma-----	Fair: large stones, slope.	Improbable: small stones.	Probable.	Poor: small stones, area reclaim, slope.
90A: Harlake-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
94C: Busby-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Good.
94D: Busby-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
96C: Macar-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
96D: Macar-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
98B: Kremlin-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
101A: Manly-----	Good.	Probable.	Improbable: too sandy.	Poor: too sandy.
Glendive-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, too clayey, small stones.
Havre-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
110A: Korchea-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Kiwanis-----	Good.	Probable.	Probable.	Poor: area reclaim.
141A: McKenzie-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, wetness.
143A: Meadowcreek-----	Good.	Probable.	Probable.	Poor: small stones, area reclaim.
144A: Bigsandy-----	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt, thin layer.
162B: Degrand-----	Good.	Probable.	Probable.	Poor: small stones.
171F: Delpoint-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cabbart-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
181D: Doney-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, slope.
Cabba-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
191B: Kenilworth----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
200F: Badland.				
201F: Cabba-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop, mudstone.				
202F: Cabba-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Dast-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
203E: Cabba-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Doney-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
211F: Cabbart-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop.				
212F: Cabbart-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Hillon-----	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
213E: Cabbart-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
213E: Delpoint-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, slope.
221E: Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
222E: Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Neldore-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
222F: Hillon-----	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Neldore-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
224E: Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
241C: Marmarth-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey.
Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
251C: Bascovy-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
252D: Bascovy-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
252D: Neldore-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
261A: Absher-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Nobe-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
272B: Attewan-----	Good.	Probable.	Probable.	Poor: too sandy, small stones, area reclaim.
300F: Rubble land.				
311B: Creed-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Gerdum-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Absher-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
321B: Kobase-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
321C: Kobase-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
323C: Sagedale-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
331B: Phillips-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Elloam-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
332B: Phillips-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
364C: Chinook-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
372B: Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
373C: Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Tinsley-----	Fair: large stones.	Probable.	Probable.	Poor: too sandy, small stones, area reclaim.
374B: Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
374C: Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
378B: Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Evanston, calcareous-----	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
379C: Evanston-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Busby-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Good.
384B: Ethridge-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
386B: Ethridge-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
386B: Evanston-----	Fair: shrink-swell low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey large stones
391B: Ferd-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Creed-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Gerdrum-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
391C: Ferd-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Creed-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Gerdrum-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
402A: Gerdrum-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Absher-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
411B: Reeder-----	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Cabba-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
411C: Reeder-----	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Cabba-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
421C: Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.



## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
421D:				
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
423B:				
Joplin, calcareous-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
423C:				
Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin, calcareous-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
424C:				
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
425C:				
Joplin, calcareous-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Telstad-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
426B:				
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
427B:				
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Joplin, calcareous-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
427C:				
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Joplin, calcareous-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
441C:				
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Hillon-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
443B:				
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ferd-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
444B:				
Kevin, calcareous----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ferd-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
445B:				
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Kevin, calcareous----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
445C:				
Kevin, calcareous----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
446C:				
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Elloam-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
451A:				
Cozberg-----	Good.	Probable.	Probable.	Poor: small stones.
Lihen-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
451C:				
Cozberg-----	Good.	Probable.	Probable.	Poor: small stones.
Lihen-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
481A: Bigsag-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
482A: Vanda-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
Marvan-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
503B: Telstad-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
503C: Telstad-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
504B: Telstad-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
504C: Telstad-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Joplin-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
511C: Turner-----	Good.	Probable.	Probable.	Poor: small stones, area reclaim.
521B: Elloam-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Absher-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
551E: Lihen-----	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, slope.
Blanchard-----	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, slope.
561B: Scobey-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
561C: Scobey-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
561D: Scobey-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Kevin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
563B: Scobey, calcareous----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
571A: Ryell-----	Good.	Probable.	Probable.	Poor: small stones, area reclaim.
Rivra-----	Poor: wetness.	Probable.	Probable.	Poor: too sandy, small stones, area reclaim.
572A: Ryell-----	Good.	Probable.	Probable.	Poor: small stones, area reclaim.
Havre-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
581B: Lonna-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
581C: Lonna-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
582B:				
Lonna-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt.
Ethridge-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
601A:				
Havre-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Glendive-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, too clayey, small stones.
603A:				
Havre-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Glendive-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, excess salt.
651E:				
Fleak-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Lihen-----	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, slope.
673B:				
Bearpaw-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Daglum-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
691B:				
Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Vida, calcareous-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Williams-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
691C:				
Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
691C: Vida, calcareous-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Williams-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
692D: Vida, calcareous-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Williams-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Zahill-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
694C: Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Williams-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
695D: Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Williams-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Zahill-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
696E: Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Zahill-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
697C: Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
697C: Bearpaw-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
698D: Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Bearpaw-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Nishon-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
698E: Vida-----	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Zahill-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Nishon-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
721E: Zahill-----	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Zahl-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
721F: Zahill-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Zahl-----	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
722F: Zahill-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Dast-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Cabba-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
743A: Shambo-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
Fairway-----	Good.	Probable.	Probable.	Poor: area reclaim.
761B: Fairway-----	Good.	Probable.	Probable.	Poor: area reclaim.
Bigsandy-----	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt, thin layer.
793B: Yamacall-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
793C: Yamacall-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
793D: Yamacall-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
831B: Enbar-----	Fair: wetness.	Probable.	Probable.	Poor: area reclaim.
Bigsandy-----	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, excess salt, thin layer.
Korchea-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
861F: Stemple-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Rubble land.				
862F: Stemple-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Rubble land.				



## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
871B: Nesda-----	Good.	Probable.	Probable.	Poor: too sandy, small stones, area reclaim.
Nesda, cool----	Good.	Probable.	Probable.	Poor: too sandy, small stones, area reclaim.
881E: Perma-----	Fair: large stones, slope.	Improbable: small stones.	Probable.	Poor: small stones, area reclaim, slope.
Whitlash-----	Poor: depth to rock, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, large stones, slope.
881F: Perma-----	Poor: slope.	Improbable: small stones.	Probable.	Poor: small stones, area reclaim, slope.
Whitlash-----	Poor: depth to rock, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, large stones, slope.
942C: Busby-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Good.
Chinook-----	Good.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
961B: Macar-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
971C: Neldore-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
Bascovy-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
971F: Neldore-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
Bascovy-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.

## Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
972F:				
Neldora-----	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
Lambeth-----	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
DA:				
Denied access.				
M-W:				
Miscellaneous water.				
W:				
Water.				

## Water Management

(The information in this report indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
2A: Riverwash.							
4B: Brockway----	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Too arid, erodes easily.
4C: Brockway----	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Too arid, erodes easily.
12C: Tally-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Soil blowing, slope.	Soil blowing.	Favorable.
12D: Tally-----	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Soil blowing, slope.	Slope, soil blowing.	Slope.
13B: Tanna-----	Moderate: depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water.	Perca slowly, depth to rock.	Depth to rock, erodes easily.	Too arid, erodes easily.
13C: Tanna-----	Moderate: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, percs slowly, depth to rock.	Depth to rock, erodes easily.	Too arid, erodes easily.
14A: McKenzie----	Slight.	Severe: hard to pack, ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, excess salt, percs slowly.
15F: Lambeth-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
16B: Degrand-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Favorable.	Erodes easily, too sandy.	Too arid, erodes easily.
19B: Kenilworth---	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
20C: Cabba-----	Severe: depth to rock.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
20D: Cabba-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
22E: Hillon-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
22F: Hillon-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
23A: Acel-----	Slight.	Slight.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
26B: Absher-----	Slight.	Severe: excess sodium, excess salt.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt.
27B: Attewan-----	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, too sandy.	Too arid, erodes easily, droughty.
28A: Nishon-----	Slight.	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
29B: Nunemaker----	Slight.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
29C: Nunemaker----	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily, rooting depth.
30B: Marvan-----	Slight.	Severe: hard to pack.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
30C: Marvan-----	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, droughty, slow intake.	Erodes easily, percs slowly.	Erodes easily, droughty, percs slowly.
32B: Kobase-----	Slight.	Slight.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily.
32C: Kobase-----	Moderate: slope.	Slight.	Severe: no water.	Deep to water.	Slope, percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
33B:							
Phillips-----	Slight.	Severe:   piping.	Severe:   no water.	Deep to water.	Percs slowly.	Erodes easily.	Too arid,   erodes easily.
35B:							
Assinniboine-	Severe:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Soil blowing.	Soil blowing.	Too arid.
35C:							
Assinniboine-	Severe:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   soil blowing.	Soil blowing.	Too arid.
36C:							
Chinook-----	Severe:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope	Favorable.	Too arid.
37B:							
Evanston-----	Moderate:   seepage.	Moderate:   piping.	Severe:   no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
37C:							
Evanston-----	Moderate:   seepage,   slope.	Moderate:   piping.	Severe:   no water.	Deep to water.	Slope	Erodes easily.	Erodes easily.
38B:							
Ethridge-----	Slight.	Moderate:   piping.	Severe:   no water.	Deep to water.	Percs slowly,   erodes easily.	Erodes easily,   percs slowly.	Too arid,   erodes easily.
39B:							
Ferd-----	Slight.	Moderate:   piping.	Severe:   no water.	Deep to water.	Percs slowly,   erodes easily.	Erodes easily,   percs slowly.	Too arid,   erodes easily,   percs slowly.
42B:							
Joplin-----	Moderate:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Percs slowly,   rooting depth.	Erodes easily,   percs slowly.	Too arid,   erodes easily.
42C:							
Joplin-----	Moderate:   seepage,   slope.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   percs slowly,   rooting depth.	Erodes easily,   percs slowly.	Too arid,   erodes easily.
44B:							
Kevin-----	Slight.	Moderate:   piping.	Severe:   no water.	Deep to water.	Percs slowly,   rooting depth.	Erodes easily,   percs slowly.	Too arid,   erodes easily.
44C:							
Kevin-----	Moderate:   slope.	Moderate:   piping.	Severe:   no water.	Deep to water.	Slope,   percs slowly,   rooting depth.	Erodes easily,   percs slowly.	Too arid,   erodes easily.
45C:							
Cozberg-----	Severe:   seepage.	Severe:   seepage,   piping.	Severe:   no water.	Deep to water.	Slope,   soil blowing.	Too sandy,   soil blowing.	Too arid.
45D:							
Cozberg-----	Severe:   seepage,   slope.	Severe:   seepage,   piping.	Severe:   no water.	Deep to water.	Slope,   soil blowing.	Slope,   too sandy,   soil blowing.	Too arid,   slope.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
47B: Marias-----	Slight.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
48B: Vanda-----	Slight.	Severe: hard to pack, excess salt.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt.
48C: Vanda-----	Slight.	Severe: hard to pack, excess salt.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt.
49C: Flowerree----	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope	Erodes easily.	Too arid, erodes easily.
50B: Telstad-----	Slight.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
51B: Turner-----	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Droughty.	Large stones, erodes easily.	Large stones, erodes easily.
53D: Sunburst-----	Severe: slope.	Slight.	Severe: no water.	Deep to water.	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
53E: Sunburst-----	Severe: slope.	Slight.	Severe: no water.	Deep to water.	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
53F: Sunburst-----	Severe: slope.	Slight.	Severe: no water.	Deep to water.	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
54B: Trudau-----	Slight.	Severe: piping.	Severe: no water.	Deep to water.	Droughty, erodes easily.	Erodes easily.	Too arid, erodes easily, droughty.
58B: Lonna-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily, excess salt.	Erodes easily.	Too arid, erodes easily.
59B: Hedstrom-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Soil blowing.	Too sandy.	Favorable.
60A: Havre-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Favorable.	Favorable.	Too arid.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
62A: Vaeda-----	Slight.	Moderate: hard to pack, excess salt.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, percs slowly.	Too arid, erodes easily, droughty.
64B: Nobe-----	Slight.	Severe: excess salt.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt.
67B: Bearpaw-----	Slight.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth.
68B: Gerber-----	Slight.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slow intake, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
69A: Vida-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
69C: Vida-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
71F: Roy-----	Severe: slope.	Slight.	Severe: no water.	Deep to water.	Slope, droughty.	Slope	Slope, droughty.
72F: Zahill-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
73D: Yetull-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, droughty, fast intake.	Too sandy, soil blowing.	Too arid, droughty.
74B: Shambo-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Slope	Erodes easily.	Erodes easily.
75B: Farnuf-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Excess salt.	Favorable.	Favorable.
75C: Farnuf-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, excess salt.	Favorable.	Favorable.
77C: Tinsley-----	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Large stones, too sandy.	Large stones, droughty.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
77E:							
Tinsley-----	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
79B:							
Yamacall-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid, erodes easily.
79C:							
Yamacall-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Too arid, erodes easily.
79D:							
Yamacall-----	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
80B:							
Williams-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
80C:							
Williams-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
82B:							
Savage-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
85B:							
Benz-----	Slight.	Moderate: piping, excess salt.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, excess salt.
88C:							
Perma-----	Severe: seepage.	Moderate: seepage, piping, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Large stones.	Large stones, droughty.
88E:							
Perma-----	Severe: seepage, slope.	Moderate: seepage, piping, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
90A:							
Harlake-----	Slight.	Severe: hard to pack.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
94C:							
Busby-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Soil blowing.	Too arid.
94D:							
Busby-----	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Slope, soil blowing.	Too arid, slope.



## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
96C:							
Macar-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Erodes easily.	Erodes easily.
96D:							
Macar-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
98B:							
Kremlin-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid, erodes easily.
101A:							
Hanly-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Glendive-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Soil blowing.	Soil blowing.	Too arid.
Havre-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid, erodes easily.
110A:							
Korchea-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
Kiwanis-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Soil blowing.	Soil blowing.	Favorable.
141A:							
McKenzie-----	Slight.	Severe: hard to pack, ponding.	Severe: no water.	Ponding, percs slowly, excess salt.	Ponding, droughty, slow intake.	Ponding, percs slowly.	Wetness, excess salt, droughty.
143A:							
Meadowcreek--	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Deep to water.	Erodes easily.	Erodes easily, too sandy.	Erodes easily.
144A:							
Bigsandy-----	Slight.	Severe: piping, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, percs slowly.
162B:							
Degradand-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Soil blowing.	Too sandy.	Too arid.
171F:							
Delpoint-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Cabbart-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
181D:							
Doney-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Cabba-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
191B:							
Kenilworth---	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Too arid, erodes easily, percs slowly.
200F:							
Badland.							
201F:							
Cabba-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop, mudstone.							
202F:							
Cabba-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Dast-----	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, depth to rock.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
203E:							
Cabba-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Doney-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
211F:							
Cabbart-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Rock outcrop.							
212F:							
Cabbart-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Hillon-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
213E:							
Cabbart-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Delpoint----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
221E:							
Hillon-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Kevin-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
222E:							
Hillon-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Neldore-----	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Slope, depth to rock.	Too arid, slope.
222F:							
Hillon-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Neldore-----	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Slope, depth to rock.	Too arid, slope.
224E:							
Hillon-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Joplin-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
241C:							
Marmarth-----	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Depth to rock, slope.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Evanston-----	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
251C:							
Bascovy-----	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly.	Depth to rock, erodes easily.	Erodes easily, depth to rock.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
252D:							
Bascovy-----	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Neldore-----	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Slope, depth to rock.	Too arid, slope.
261A:							
Absher-----	Slight.	Severe: excess sodium, excess salt.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt.
Nobe-----	Slight.	Severe: excess salt.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, percs slowly.	Too arid, excess salt.
272B:							
Attewan-----	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Droughty, soil blowing.	Too sandy.	Too arid, droughty.
300F:							
Rubble land.							
311B:							
Creed-----	Slight.	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty, percs slowly.	Erodes easily, percs slowly.	Too arid, excess sodium.
Gerdum-----	Moderate: seepage.	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, percs slowly.	Too arid, excess sodium.
Absher-----	Slight.	Severe: excess sodium, excess salt.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt.
321B:							
Kobase-----	Slight.	Slight.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily.
321C:							
Kobase-----	Moderate: slope.	Slight.	Severe: no water.	Deep to water.	Slope, percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily.
323C:							
Sagedale-----	Moderate: slope.	Slight.	Severe: no water.	Deep to water.	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
331B:							
Phillips-----	Slight.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily.	Too arid, erodes easily.
Elloam-----	Slight.	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, percs slowly.	Too arid, excess sodium.
332B:							
Phillips-----	Slight.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily.	Too arid, erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
332B: Kevin-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
364C: Chinook-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Soil blowing.	Too arid.
372B: Evanston-----	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Soil blowing.	Erodes easily, soil blowing.	Erodes easily.
373C: Evanston-----	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope	Erodes easily.	Erodes easily.
Tinsley-----	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water.	Slope, large stones, droughty.	Large stones, too sandy.	Large stones, droughty.
374B: Evanston-----	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
374C: Evanston-----	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope	Erodes easily.	Erodes easily.
378B: Evanston-----	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
Evanston, calcareous--	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
379C: Evanston-----	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope	Erodes easily.	Erodes easily.
Busby-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Soil blowing.	Too arid.
384B: Ethridge-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
386B: Ethridge-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
Evanston-----	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
391B:							
Ferd-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Creed-----	Slight.	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty, percs slowly.	Erodes easily, percs slowly.	Too arid, excess sodium.
Gerdrum-----	Moderate: seepage.	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, percs slowly.	Too arid, excess sodium.
391C:							
Ferd-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Creed-----	Moderate: slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Too arid, excess sodium.
Gerdrum-----	Moderate: seepage, slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty.	Erodes easily, percs slowly.	Too arid, excess sodium.
402A:							
Gerdrum-----	Moderate: seepage.	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, percs slowly.	Too arid, excess sodium.
Absher-----	Slight.	Severe: excess sodium, excess salt.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt.
411B:							
Reeder-----	Severe: seepage.	Severe: thin layer, piping.	Severe: no water.	Deep to water.	Depth to rock.	Depth to rock.	Depth to rock.
Cabba-----	Severe: depth to rock.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
411C:							
Reeder-----	Severe: seepage.	Severe: thin layer, piping.	Severe: no water.	Deep to water.	Slope, depth to rock.	Depth to rock.	Depth to rock.
Cabba-----	Severe: depth to rock.	Severe: piping.	Severe: no water.	Deep to water.	Slope, soil blowing, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
421C:							
Joplin-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Hillon-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
421D:							
Joplin-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
Hillon-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, percs slowly.	Too arid, slope, erodes easily.
423B:							
Joplin, calcareous--	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Hillon-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
423C:							
Hillon-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
Joplin, calcareous--	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
424C:							
Joplin-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly.	Erodes easily.	Too arid, erodes easily.
Hillon-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly.	Percs slowly.	Too arid, percs slowly.
425C:							
Joplin, calcareous--	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Telstad-----	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
426B:							
Joplin-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
427B:							
Joplin-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Joplin, calcareous--	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
427C:							
Joplin-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
427C: Joplin, calcareous--	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
441C: Kevin-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Hillon-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
443B: Kevin-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Ferd-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
444B: Kevin, calcareous--	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Ferd-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
445B: Kevin-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Kevin, calcareous--	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
445C: Kevin, calcareous--	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Kevin-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
446C: Kevin-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
Elloam-----	Moderate: slope.	Severe: excess sodium.	Severe: no water.	Deep to water.	Slope, droughty.	Erodes easily, percs slowly.	Too arid, excess sodium.



## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
451A:							
Cozberg-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Soil blowing.	Too sandy, soil blowing.	Too arid.
Lihea-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Droughty.	Too sandy, soil blowing.	Droughty.
451C:							
Cozberg-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, soil blowing.	Too sandy, soil blowing.	Too arid.
Lihea-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, droughty.	Too sandy, soil blowing.	Droughty.
481A:							
Bigsag-----	Slight.	Severe: wetness, excess sodium, excess salt.	Severe: slow refill, salty water.	Percs slowly, excess salt.	Wetness, droughty, slow intake.	Erodes easily, wetness, percs slowly.	Wetness, excess salt, excess sodium.
482A:							
Vanda-----	Slight.	Severe: hard to pack, excess salt.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, excess salt.
Marvan-----	Slight.	Severe: hard to pack.	Severe: no water.	Deep to water.	Droughty, slow intake.	Erodes easily, percs slowly.	Excess salt, erodes easily, droughty.
503B:							
Telstad-----	Slight.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
Joplin-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
503C:							
Telstad-----	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
Joplin-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
504B:							
Telstad-----	Slight.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
Joplin-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
504C:							
Telstad-----	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
Joplin-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
511C:							
Turner-----	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Slope, droughty, soil blowing.	Large stones.	Large stones.
521B:							
Elloam-----	Slight.	Severe: excess sodium.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, percs slowly.	Too arid, excess sodium.
Absher-----	Slight.	Severe: excess sodium, excess salt.	Severe: no water.	Deep to water.	Droughty.	Erodes easily, percs slowly.	Too arid, excess salt.
551E:							
Lihen-----	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Blanchard----	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
561B:							
Scobey-----	Slight.	Slight.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily.	Too arid, erodes easily.
Kevin-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
561C:							
Scobey-----	Moderate: slope.	Slight.	Severe: no water.	Deep to water.	Slope, percs slowly.	Erodes easily.	Too arid, erodes easily.
Kevin-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Too arid, erodes easily.
561D:							
Scobey-----	Severe: slope.	Slight.	Severe: no water.	Deep to water.	Slope, percs slowly.	Slope, erodes easily.	Too arid, slope, erodes easily.
Kevin-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
563B:							
Scobey, calcareous--	Slight.	Slight.	Severe: no water.	Deep to water.	Percs slowly.	Erodes easily.	Too arid, erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
571A:							
Ryell-----	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Flooding.	Erodes easily, too sandy.	Too arid, erodes easily.
Rivra-----	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Flooding, large stones.	Large stones, wetness.	Large stones, wetness, too sandy.	Too arid, large stones, wetness.
572A:							
Ryell-----	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water.	Flooding.	Erodes easily, too sandy.	Too arid, erodes easily.
Havre-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily, flooding.	Erodes easily.	Too arid, erodes easily.
581B:							
Lonna-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily, excess salt.	Erodes easily.	Too arid, erodes easily.
581C:							
Lonna-----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily, excess salt.	Erodes easily.	Too arid, erodes easily.
582B:							
Lonna-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily, excess salt.	Erodes easily.	Too arid, erodes easily.
Ethridge----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Too arid, erodes easily.
601A:							
Havre-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid, erodes easily.
Glendive-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Soil blowing.	Soil blowing.	Too arid.
603A:							
Havre-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Erodes easily, flooding.	Erodes easily.	Too arid, erodes easily.
Glendive-----	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Soil blowing, flooding, excess salt.	Soil blowing.	Too arid.
651E:							
Fleak-----	Severe: depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water.	Droughty, soil blowing.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
Lihen-----	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water.	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
673B:							
Bearpaw-----	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
673B:							
Daglum-----	Slight.	Severe: excess sodium.	Severe: no water.	Deep to water.	Percs slowly.	Percs slowly.	Excess sodium, percs slowly.
691B:							
Vida-----	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Vida, calcareous--	Slight.	Moderate: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Williams----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
691C:							
Vida-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Vida, calcareous--	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Williams----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
692D:							
Vida, calcareous--	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Williams----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Zahill-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
694C:							
Vida-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Williams----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
695D:							
Vida-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Williams----	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water.	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
695D:							
Zahill-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
696E:							
Vida-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Zahill-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
697C:							
Vida-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Bearpaw-----	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth.
698D:							
Vida-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Bearpaw-----	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, rooting depth.
Nishon-----	Slight.	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
698E:							
Vida-----	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Zahill-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Nishon-----	Slight.	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
721E:							
Zahill-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Zahl-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
721F:							
Zahill-----	Severe:   slope.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   percs slowly,   rooting depth.	Slope,   erodes easily,   percs slowly.	Slope,   erodes easily,   rooting depth.
Zahl-----	Severe:   slope.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   percs slowly.	Slope,   erodes easily,   percs slowly.	Slope,   erodes easily,   percs slowly.
722F:							
Zahill-----	Severe:   slope.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   percs slowly,   rooting depth.	Slope,   erodes easily,   percs slowly.	Slope,   erodes easily,   rooting depth.
Dast-----	Severe:   seepage,   slope.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   soil blowing,   depth to rock.	Slope,   depth to rock,   soil blowing.	Slope,   depth to rock.
Cabba-----	Severe:   depth to rock,   slope.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   soil blowing,   depth to rock.	Slope,   depth to rock,   erodes easily.	Slope,   erodes easily,   depth to rock.
743A:							
Shambo-----	Severe:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
Fairway-----	Severe:   seepage.	Severe:   piping.	Severe:   cutbanks   cave.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
761B:							
Fairway-----	Severe:   seepage.	Severe:   piping.	Severe:   cutbanks   cave.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
Bigsandy-----	Slight.	Severe:   piping,   wetness.	Severe:   slow   refill,   cutbanks   cave.	Percs slowly,   flooding,   frost action.	Wetness,   percs slowly,   erodes easily.	Erodes easily,   wetness,   too sandy.	Wetness,   erodes easily,   percs slowly.
793B:							
Yamacall-----	Severe:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Erodes easily.	Erodes easily.	Too arid,   erodes easily.
793C:							
Yamacall-----	Severe:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   erodes easily.	Erodes easily.	Too arid,   erodes easily.
793D:							
Yamacall-----	Severe:   seepage,   slope.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   erodes easily.	Slope,   erodes easily.	Too arid,   slope,   erodes easily.
831B:							
Enbar-----	Severe:   seepage.	Severe:   piping.	Severe:   cutbanks   cave.	Frost action.	Wetness,   erodes easily.	Erodes easily,   wetness.	Erodes easily.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
831B:							
Bigsandy-----	Slight.	Severe:   piping,   wetness.	Severe:   slow   refill,   cutbanks   cave.	Percs slowly,   flooding,   frost action.	Wetness,   percs slowly,   erodes easily.	Erodes easily,   wetness,   too sandy.	Wetness,   erodes easily,   percs slowly.
Korchea-----	Moderate:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Favorable.	Erodes easily.	Erodes easily.
861F:							
Stemple-----	Severe:   slope.	Severe:   large stones.	Severe:   no water.	Deep to water.	Slope,   large stones,   droughty.	Slope,   large stones.	Large stones,   slope,   droughty.
Rubble land.							
862F:							
Stemple-----	Severe:   slope.	Severe:   large stones.	Severe:   no water.	Deep to water.	Slope,   large stones,   droughty.	Slope,   large stones.	Large stones,   slope,   droughty.
Rubble land.							
871B:							
Nesda-----	Severe:   seepage.	Severe:   seepage.	Severe:   no water.	Deep to water.	Droughty.	Large stones,   too sandy.	Large stones,   droughty.
Nesda, cool--	Severe:   seepage.	Severe:   seepage.	Severe:   no water.	Deep to water.	Droughty.	Large stones,   too sandy.	Large stones,   droughty.
881E:							
Perma-----	Severe:   seepage,   slope.	Severe:   large stones.	Severe:   no water.	Deep to water.	Slope,   large stones,   droughty.	Slope,   large stones.	Large stones,   slope,   droughty.
Whitlash-----	Severe:   depth to rock,   slope.	Severe:   large stones.	Severe:   no water.	Deep to water.	Slope,   large stones,   droughty.	Slope,   large stones,   depth to rock.	Large stones,   slope,   droughty.
881F:							
Perma-----	Severe:   seepage,   slope.	Severe:   large stones.	Severe:   no water.	Deep to water.	Slope,   large stones,   droughty.	Slope,   large stones.	Large stones,   slope,   droughty.
Whitlash-----	Severe:   depth to rock,   slope.	Severe:   large stones.	Severe:   no water.	Deep to water.	Slope,   large stones,   droughty.	Slope,   large stones,   depth to rock.	Large stones,   slope,   droughty.
942C:							
Busby-----	Severe:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   soil blowing.	Soil blowing.	Too arid.
Chinook-----	Severe:   seepage.	Severe:   piping.	Severe:   no water.	Deep to water.	Slope,   soil blowing.	Soil blowing.	Too arid.

## Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
961B:							
Macar-----	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water.	Favorable.	Favorable.	Favorable.
971C:							
Neldore-----	Severe: depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Depth to rock.	Too arid.
Bascovy-----	Moderate: depth to rock, slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
971F:							
Neldore-----	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Slope, depth to rock.	Too arid, slope.
Bascovy-----	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
972F:							
Neldore-----	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water.	Slope, slow intake, percs slowly.	Slope, depth to rock.	Too arid, slope.
Lambeth-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water.	Slope, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
Rock outcrop.							
DA:							
Denied access.							
M-W:							
Miscellaneous water.							
W:							
Water.							



# Soil Properties

---

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

## Engineering Index Properties

The table "Engineering Index Properties" gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles

coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

*Classification* of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986) and the Unified soil classification system (ASTM, 1993).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

*Rock fragments* larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3

inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

*Liquid limit and plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

## Physical and Chemical Properties

The tables "Physical Properties of the Soils" and "Chemical Properties of the Soils" show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

The following paragraphs describe the columns in the table "Physical Properties of the Soils."

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

*Clay* as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

*Moist bulk density* is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at  $\frac{1}{3}$ -bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table "Physical

density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Permeability* refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Shrink-swell potential* is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent;

percent. *Very high*, more than 9 percent, is sometimes used.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In the table "Physical Properties of Soils," the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

*Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

*Erosion factor Kf* indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

*Erosion factor T* is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Wind erodibility groups* are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

The following paragraphs describe the columns in the table "Chemical Properties of the Soils."

*Cation-exchange capacity* is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

*Soil reaction* is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Calcium carbonate equivalent* is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

*Gypsum* is given as the percent, by weight, of hydrated calcium sulfates in the soil. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

*Salinity* is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

*Sodium adsorption ratio* is the measure of sodium relative to calcium and magnesium in the water extract from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

## Water Features

The table "Water Features" gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

*Hydrologic soil groups* are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the intake rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

*Flooding*, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

The table "Water Features" gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). The term *common* includes both frequent and occasional flooding.

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt,

organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*High water table* (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the table "Water Features" are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time is allowed for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

*Ponding* is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation.

## Soil Features

The table "Soil Features" gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

*Depth to bedrock* is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is

hard or massive, blasting or special equipment generally is needed for excavation.

*Potential frost action* is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

## Engineering Index Properties

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
2A: Riverwash.												
4B: Brockway-----	0-6	Silt loam	CL-ML	A-4	0	0	100	100	95-100	85-95	25-30	5-10
	6-15	Silt loam, loam	CL-ML	A-4	0	0	100	100	95-100	85-95	25-30	5-10
	15-38	Silt loam, silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-95	25-40	5-15
	38-60	Stratified very fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-90	25-40	5-15
4C: Brockway-----	0-6	Silt loam	CL-ML	A-4	0	0	100	100	95-100	85-95	25-30	5-10
	6-15	Silt loam, loam	CL-ML	A-4	0	0	100	100	95-100	85-95	25-30	5-10
	15-38	Silt loam, silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-95	25-40	5-15
	38-60	Stratified very fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-90	25-40	5-15
12C: Tally-----	0-4	Sandy loam	SM	A-2, A-4	0	0	90-100	80-100	55-80	25-50	15-25	NP-5
	4-14	Fine sandy loam, sandy loam	SM, SC-SM	A-4, A-2	0	0	90-100	80-100	60-100	25-50	15-25	NP-10
	14-42	Sandy loam, fine sandy loam, loamy fine sand	SM	A-4, A-2	0	0	90-100	80-100	60-100	15-50	15-25	NP-5
	42-60	Loamy fine sand, fine sand, sandy loam	SM	A-2	0	0	90-100	80-100	60-85	15-35	---	NP
12D: Tally-----	0-4	Sandy loam	SM	A-2, A-4	0	0	90-100	80-100	55-80	25-50	15-25	NP-5
	4-14	Fine sandy loam, sandy loam	SM, SC-SM	A-4, A-2	0	0	90-100	80-100	60-100	25-50	15-25	NP-10
	14-42	Sandy loam, fine sandy loam, loamy fine sand	SM	A-4, A-2	0	0	90-100	80-100	60-100	15-50	15-25	NP-5
	42-60	Loamy fine sand, fine sand, sandy loam	SM	A-2	0	0	90-100	80-100	60-85	15-35	---	NP

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
13B: Tanna-----	0-6	Clay loam	CL	A-6	0	0-5	90-100	90-100	85-95	70-80	25-40	10-20
	6-15	Clay loam, clay, silty clay loam	CL	A-6, A-7	0	0-5	90-100	90-100	80-95	75-90	35-45	15-25
	15-28	Very channery loam, channery clay loam, loam	GM-GC, CL-ML, SC-SM	A-2, A-4	0	0-10	40-100	30-95	25-80	20-70	25-30	5-10
	28-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
13C: Tanna-----	0-6	Clay loam	CL	A-6	0	0-5	90-100	90-100	85-95	70-80	25-40	10-20
	6-15	Clay loam, clay, silty clay loam	CL	A-6, A-7	0	0-5	90-100	90-100	80-95	75-90	35-45	15-25
	15-28	Very channery loam, channery clay loam, loam	GM-GC, CL-ML, SC-SM	A-2, A-4	0	0-10	40-100	30-95	25-80	20-70	25-30	5-10
	28-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
14A: McKenzie-----	0-4	Silty clay	CH	A-7	0	0	100	100	90-100	75-95	50-75	25-50
	4-24	Clay, silty clay	CH	A-7	0	0	100	100	95-100	75-95	50-75	25-50
	24-60	Clay, silty clay	CH	A-7	0	0	100	100	95-100	75-95	50-75	25-50
15F: Lambeth-----	0-4	Silt loam	CL-ML	A-4	0	0	100	100	90-100	75-90	20-30	5-10
	4-60	Silt loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	75-90	20-40	5-20
16B: Degrand-----	0-5	Loam	ML, SM	A-4	0	0-5	85-100	80-100	60-85	40-60	25-35	NP-10
	5-24	Sandy clay loam, clay loam	CL, SC, CL-ML, SC-SM	A-6, A-4	0	0-5	85-100	80-100	50-90	35-80	25-40	5-15
	24-60	Sand, gravelly sand, loamy sand	SP, SP-SM SM	A-1, A-3, A-2	0	0-5	65-100	55-100	25-70	0-15	---	NP
19B: Kenilworth-----	0-6	Loam	ML, CL-ML	A-4	0	0	100	100	80-90	55-65	15-30	NP-10
	6-11	Fine sandy loam, sandy clay loam	CL-ML, SC-SM	A-4	0	0	100	100	75-90	35-55	20-30	5-10
	11-15	Sandy clay loam, clay loam	CL, SC	A-6	0	0	100	100	85-95	45-75	25-35	10-15
	15-24	Clay loam, silty clay loam	CL	A-6	0	0	95-100	90-100	80-100	70-90	30-40	10-20
	24-60	Clay loam, silty clay loam	CL	A-6	0	0	95-100	90-100	80-100	70-90	30-40	10-20

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
20C:												
Cabba-----	0-6	Loam	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	6-15	Clay loam, silty clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	15-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
20D:												
Cabba-----	0-6	Loam	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	6-15	Clay loam, silty clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	15-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
22E:												
Hillon-----	0-5	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
22F:												
Hillon-----	0-5	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
23A:												
Acel-----	0-5	Silty clay loam	CL	A-6	0	0	95-100	95-100	85-100	80-95	30-40	10-15
	5-22	Silty clay, clay	CL, CH	A-7	0	0	95-100	95-100	85-100	75-95	40-60	20-40
	22-60	Silty clay loam, silty clay, clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	35-50	15-30
26B:												
Absher-----	0-6	Clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-35
	6-13	Silty clay, clay, clay loam	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-40
	13-60	Clay loam, clay, silty clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-55	20-35
27B:												
Attewan-----	0-4	Loam	ML, CL-ML	A-4	0	0-5	85-100	80-100	70-90	55-75	20-30	NP-10
	4-12	Clay loam, sandy clay loam, gravelly loam	CL, SC	A-6	0	0-5	75-100	70-100	55-85	35-70	30-40	10-20
	12-27	Clay loam, gravelly loam, sandy clay loam	CL, SC, GC	A-6	0	0-5	70-100	65-100	50-85	35-65	30-40	10-20



## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
27B: Attewan-----	27-60	Very gravelly loamy sand, extremely gravelly loamy sand, very gravelly sand	GP, GP-GM, GM, SM	A-1	0	0-15	25-55	15-50	5-20	0-15	---	NP
28A: Nishon-----	0-4	Clay loam	CL	A-6, A-7	0	0	100	100	85-100	60-85	30-45	10-20
	4-22	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-45
	22-60	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-60	15-40
29B: Nunemaker-----	0-4	Silty clay loam	CL	A-7	0	0	95-100	95-100	95-100	85-95	40-45	20-25
	4-12	Silty clay	CH	A-7	0	0	95-100	95-100	95-100	85-95	50-65	25-35
	12-60	Clay loam, clay	CL, CH	A-7	0	0	95-100	90-100	80-100	70-90	40-55	20-30
29C: Nunemaker-----	0-4	Silty clay loam	CL	A-7	0	0	95-100	95-100	95-100	85-95	40-45	20-25
	4-12	Silty clay	CH	A-7	0	0	95-100	95-100	95-100	85-95	50-65	25-35
	12-60	Clay loam, clay	CL, CH	A-7	0	0	95-100	90-100	80-100	70-90	40-55	20-30
30B: Marvan-----	0-7	Silty clay	CL, CH	A-7	0	0	100	100	95-100	85-100	40-65	20-45
	7-30	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	30-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
30C: Marvan-----	0-7	Silty clay	CL, CH	A-7	0	0	100	100	95-100	85-100	40-65	20-45
	7-30	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	30-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
32B: Kobase-----	0-12	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	12-28	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
	28-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
32C: Kobase-----	0-12	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	12-28	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25
	28-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-50	15-25

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	Percentage passing					
							4	10	40	200		
	In				Pct	Pct					Pct	
33B:												
Phillips-----	0-7	Clay loam	CL	A-6	0	0-5	85-100	80-100	80-100	60-80	30-40	10-15
	7-16	Clay, clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-95	60-85	35-50	15-25
	16-42	Clay loam, loam	CL	A-6, A-7	0	0-5	85-100	80-100	75-100	55-80	30-45	10-20
	42-60	Clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	85-100	80-100	70-90	55-75	25-40	5-15
35B:												
Assinniboine----	0-6	Fine sandy loam	SM	A-4, A-2	0	0	85-100	75-100	55-80	25-45	15-25	NP-5
	6-15	Sandy clay loam, fine sandy loam	CL-ML, SC-SM, CL, SC	A-4, A-6	0	0	80-100	75-100	65-95	40-65	25-35	5-15
	15-60	Stratified fine sandy loam to fine sand	SM	A-4, A-2	0	0	85-100	75-100	55-80	10-40	---	NP
35C:												
Assinniboine----	0-6	Fine sandy loam	SM	A-4, A-2	0	0	85-100	75-100	55-80	25-45	15-25	NP-5
	6-15	Sandy clay loam, fine sandy loam	CL-ML, SC-SM, CL, SC	A-4, A-6	0	0	80-100	75-100	65-95	40-65	25-35	5-15
	15-60	Stratified fine sandy loam to fine sand	SM	A-4, A-2	0	0	85-100	75-100	55-80	10-40	---	NP
36C:												
Chinook-----	0-6	Loam	CL-ML	A-4	0	0	80-100	75-100	70-95	50-75	20-30	5-10
	6-23	Fine sandy loam, sandy loam	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	23-60	Fine sandy loam, loamy fine sand, sandy loam	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
37B:												
Evanston-----	0-6	Clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-80	30-40	10-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
37C:												
Evanston-----	0-6	Clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-80	30-40	10-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
					>10 inches	3-10 inches	4	10	40	200		
			Unified	AASHTO	Pct	Pct					Pct	
	In											
37C: Evanston-----	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
38B: Ethridge-----	0-6	Clay loam	CL	A-6	0	0	100	95-100	85-100	70-80	25-40	10-20
	6-15	Silty clay, silty clay loam, clay	CL	A-7	0	0	100	95-100	95-100	90-95	40-50	20-30
	15-38	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	35-50	15-30
	38-60	Silty clay loam, clay loam, silt loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	30-50	10-25
39B: Ferd-----	0-5	Loam	CL-ML, CL	A-4	0	0	100	95-100	80-95	55-75	25-30	5-10
	5-9	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-95	70-90	25-40	5-15
	9-16	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	85-100	70-90	35-50	15-30
	16-41	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
	41-60	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
42B: Joplin-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
42C: Joplin-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
42C: Joplin-----	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
44B: Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
44C: Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
45C: Cozberg-----	0-8	Fine sandy loam	SM	A-4	0	0	95-100	95-100	70-85	35-50	20-30	NP-5
	8-18	Fine sandy loam, very fine sandy loam, sandy loam	SM, ML	A-4	0	0	95-100	80-100	60-90	35-60	20-30	NP-5
	18-60	Loamy sand, sand, gravelly loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0	60-100	50-95	25-70	5-30	---	NP
45D: Cozberg-----	0-8	Fine sandy loam	SM	A-4	0	0	95-100	95-100	70-85	35-50	20-30	NP-5
	8-18	Fine sandy loam, very fine sandy loam, sandy loam	SM, ML	A-4	0	0	95-100	80-100	60-90	35-60	20-30	NP-5
	18-60	Loamy sand, sand, gravelly loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0	60-100	50-95	25-70	5-30	---	NP
47B: Marias-----	0-5	Silty clay	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	20-40
	5-27	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	27-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
48B: Vanda-----	0-9	Silty clay	CL, CH	A-7	0	0	100	100	95-100	75-95	40-65	20-45
	9-60	Clay, silty clay, silty clay loam	CL, CH	A-7, A-6	0	0	100	100	95-100	80-95	35-65	15-45

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
48C: Vanda-----	0-9	Silty clay	CL, CH	A-7	0	0	100	100	95-100	75-95	40-65	20-45
	9-60	Clay, silty clay, silty clay loam	CL, CH	A-7, A-6	0	0	100	100	95-100	80-95	35-65	15-45
49C: Flowerree-----	0-5	Silt loam	ML	A-4	0	0	100	100	90-100	70-90	20-35	NP-10
	5-11	Silty clay loam, silt loam	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	85-95	25-40	5-15
	11-60	Stratified silty clay loam to very fine sandy loam	CL, CL-ML	A-6, A-4	0	0	100	100	75-100	65-85	25-40	5-15
50B: Telstad-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	70-95	55-80	30-35	10-15
	5-19	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	19-37	Clay loam, loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	37-60	Loam, clay loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
51B: Turner-----	0-5	Loam	CL-ML	A-4	0	0-10	80-100	75-100	65-95	50-75	25-30	5-10
	5-15	Clay loam, sandy clay loam, gravelly loam	CL, GC, SC	A-6	0	0-10	65-100	60-100	55-90	35-70	30-40	10-20
	15-21	Loam, clay loam, gravelly loam	CL, GC, SC	A-6	0	0-10	65-100	60-100	55-95	40-75	30-40	10-15
	21-60	Very gravelly loamy sand, very gravelly sand, extremely gravelly sand	GP, GM, GP-GM	A-1	0	10-30	25-60	15-50	10-35	0-15	---	NP
53D: Sunburst-----	0-6	Clay loam	CL	A-6	0	0-10	95-100	85-95	85-95	75-85	30-40	10-20
	6-60	Clay, clay loam, silty clay	CL	A-7, A-6	0	0-10	95-100	85-95	80-90	75-85	35-50	15-30
53E: Sunburst-----	0-6	Clay loam	CL	A-6	0	0-10	95-100	85-95	85-95	75-85	30-40	10-20
	6-60	Clay, clay loam, silty clay	CL	A-7, A-6	0	0-10	95-100	85-95	80-90	75-85	35-50	15-30
53F: Sunburst-----	0-6	Clay loam	CL	A-6	0	0-10	95-100	85-95	85-95	75-85	30-40	10-20
	6-60	Clay, clay loam, silty clay	CL	A-7, A-6	0	0-10	95-100	85-95	80-90	75-85	35-50	15-30

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
54B:												
Trudau-----	0-4	Loam	CL-ML	A-4	0	0	100	100	85-95	60-75	20-30	5-10
	4-25	Loam, clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	85-100	60-80	25-40	5-15
	25-60	Stratified clay loam to sandy loam	CL-ML, ML	A-4	0	0-10	90-100	85-100	70-100	55-80	25-35	5-10
58B:												
Lonna-----	0-5	Silt loam	CL-ML	A-4	0	0	100	100	90-100	75-90	25-30	5-10
	5-11	Silt loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	11-60	Silty clay loam, silt loam, very fine sandy loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-90	25-35	5-15
59B:												
Hedstrom-----	0-5	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	90-100	85-100	60-85	35-60	20-25	5-10
	5-21	Sandy clay loam, clay loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	70-85	50-65	25-35	5-15
	21-31	Sandy clay loam, loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	70-90	50-65	25-35	5-15
	31-60	Fine sand, sand, loamy fine sand	SM	A-2	0	0	80-100	75-100	50-80	15-35	---	NP
60A:												
Havre-----	0-6	Silty clay loam	CL	A-6	0	0	100	100	85-100	75-95	30-40	10-20
	6-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	60-80	20-35	5-15
62A:												
Vaeda-----	0-2	Silty clay loam	CL	A-7	0	0	95-100	75-100	70-95	55-90	45-50	20-25
	2-13	Silty clay, clay, silty clay loam	CL, CH	A-7	0	0	95-100	75-100	70-95	55-90	45-65	20-40
	13-60	Silty clay, clay, silty clay loam	CL, CH	A-7	0	0	95-100	75-100	70-95	55-90	45-65	20-40
64B:												
Nobe-----	0-4	Clay	CL, CH	A-7	0	0	100	100	90-100	80-95	40-55	15-30
	4-34	Silty clay, clay, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	20-35
	34-60	Stratified loam to clay	CL, CH	A-7, A-6	0	0	100	100	85-100	75-90	35-55	15-30

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
67B: Bearpaw-----	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-13	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	13-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
68B: Gerber-----	0-6	Clay	CL, CH	A-7	0	0	100	95-100	90-100	80-95	40-55	15-30
	6-15	Silty clay, clay	CL, CH	A-7	0	0	100	95-100	85-100	75-95	40-65	20-45
	15-20	Silty clay, silty clay loam, clay loam	CL, CH	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-55	15-35
	20-60	Clay loam, silty clay, silty clay loam	CL, CH	A-7, A-6	0	0	95-100	90-100	80-100	65-95	35-55	15-35
69A: Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
69C: Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
71F: Roy-----	0-6	Gravelly clay loam	CL-ML, CL, GC, GM-GC	A-4, A-6	0-5	0-10	65-80	60-75	55-70	40-60	25-35	5-15
	6-25	Very gravelly clay loam, very gravelly clay	GC	A-2, A-6, A-7	0-5	0-15	40-55	35-50	30-50	25-45	30-50	15-30
	25-60	Extremely gravelly sandy clay loam, extremely gravelly clay loam	GC, GM-GC	A-2	0-5	0-15	20-30	15-25	10-25	5-20	25-35	5-15
72F: Zahill-----	0-5	Loam	CL-ML, ML	A-4	0	0-10	90-100	85-95	80-90	60-75	20-30	NP-10
	5-20	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	20-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
73D:												
Yetull-----	0-4	Loamy fine sand	SM	A-2	0	0-5	95-100	95-100	50-75	10-30	---	NP
	4-60	Loamy coarse sand, sand, loamy sand	SM, SP-SM	A-1, A-3, A-2	0	0-5	95-100	95-100	45-70	5-30	---	NP
74B:												
Shambo-----	0-6	Loam	CL-ML	A-4	0	0	100	100	85-100	65-90	25-30	5-10
	6-15	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	85-100	65-90	25-35	5-15
	15-60	Gravelly sandy loam	SM	A-2, A-1	0	0	85-100	55-75	35-55	15-30	20-25	NP-5
75B:												
Farnuf-----	0-7	Clay loam	CL, CL-ML	A-6, A-4	0	0	80-100	75-100	60-100	55-80	25-40	5-15
	7-15	Clay loam, loam, silty clay loam	CL	A-6	0	0	80-100	75-100	65-95	50-90	25-40	10-20
	15-60	Stratified gravelly sandy loam to silty clay loam	CL, SC, CL-ML, SC-SM	A-6, A-4	0	0-15	75-90	65-85	50-80	45-60	20-30	5-15
75C:												
Farnuf-----	0-7	Clay loam	CL, CL-ML	A-6, A-4	0	0	80-100	75-100	60-100	55-80	25-40	5-15
	7-15	Clay loam, loam, silty clay loam	CL	A-6	0	0	80-100	75-100	65-95	50-90	25-40	10-20
	15-60	Stratified gravelly sandy loam to silty clay loam	CL, SC, CL-ML, SC-SM	A-6, A-4	0	0-15	75-90	65-85	50-80	45-60	20-30	5-15
77C:												
Tinsley-----	0-4	Gravelly sandy loam	SM	A-2, A-1	0	0-10	70-90	55-75	35-55	15-35	15-20	NP-5
	4-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand	GM, SM, SP-SM, GP-GM	A-1	0	10-40	40-70	25-55	10-35	5-15	---	NP
77E:												
Tinsley-----	0-4	Gravelly sandy loam	SM	A-2, A-1	0	0-10	70-90	55-75	35-55	15-35	15-20	NP-5
	4-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand	GM, SM, SP-SM, GP-GM	A-1	0	10-40	40-70	25-55	10-35	5-15	---	NP



## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
79B:												
Yamacall-----	0-6	Loam	CL-ML	A-4	0	0-5	85-100	80-100	60-85	55-75	25-30	5-10
	6-11	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	65-90	60-80	25-35	5-15
	11-60	Stratified gravelly loam to loamy sand	ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-5
79C:												
Yamacall-----	0-6	Loam	CL-ML	A-4	0	0-5	85-100	80-100	60-85	55-75	25-30	5-10
	6-11	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	65-90	60-80	25-35	5-15
	11-60	Stratified gravelly loam to loamy sand	ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-5
79D:												
Yamacall-----	0-6	Loam	CL-ML	A-4	0	0-5	85-100	80-100	60-85	55-75	25-30	5-10
	6-11	Loam, clay loam, silt loam	CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	65-90	60-80	25-35	5-15
	11-60	Stratified gravelly loam to loamy sand	ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-5
80B:												
Williams-----	0-5	Clay loam	CL	A-6	0	0-5	95-100	85-100	80-90	70-85	25-35	10-15
	5-13	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	13-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
80C:												
Williams-----	0-5	Clay loam	CL	A-6	0	0-5	95-100	85-100	80-90	70-85	25-35	10-15
	5-13	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	13-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
82B:												
Savage-----	0-5	Silty clay loam	CL, CL-ML	A-6, A-4	0	0	95-100	95-100	90-100	75-95	25-40	5-15
	5-16	Clay, silty clay, silty clay loam	CL	A-7, A-6	0	0	95-100	95-100	85-100	75-95	35-50	15-30
	16-60	Silty clay, silty clay loam, clay	CL	A-7, A-6	0	0-5	90-100	85-100	75-100	65-95	30-50	10-30
85B:												
Benz-----	0-8	Clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-15
	8-60	Stratified clay loam to sandy loam	CL	A-6	0	0	100	100	90-95	65-80	30-40	10-20

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
88C: Perma-----	0-10	Gravelly loam	SM, SC-SM, GM, GM-GC	A-4	0	0-15	65-85	60-75	50-65	35-50	20-30	NP-10
	10-30	Very gravelly sandy loam, very cobbly loam, very cobbly sandy loam	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0	10-40	50-70	40-60	30-50	20-40	20-30	NP-10
	30-60	Extremely gravelly loamy sand, extremely cobbly sandy loam, extremely gravelly loam	GM, GP, GP-GM	A-1	0	15-40	20-40	10-30	5-25	0-15	15-25	NP-5
88E: Perma-----	0-10	Gravelly loam	SM, SC-SM, GM, GM-GC	A-4	0	0-15	65-85	60-75	50-65	35-50	20-30	NP-10
	10-30	Very gravelly sandy loam, very cobbly loam, very cobbly sandy loam	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0	10-40	50-70	40-60	30-50	20-40	20-30	NP-10
	30-60	Extremely gravelly loamy sand, extremely cobbly sandy loam, extremely gravelly loam	GM, GP, GP-GM	A-1	0	15-40	20-40	10-30	5-25	0-15	15-25	NP-5
90A: Harlake-----	0-4	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	80-90	30-45	10-20
	4-16	Stratified clay to silt loam	CL, CH	A-7	0	0	100	100	95-100	85-95	40-70	15-45
	16-60	Stratified silty clay loam to fine sandy loam	CL, CL-ML	A-6, A-4	0	0	100	100	85-95	60-75	20-40	5-15
94C: Busby-----	0-5	Fine sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	5-13	Fine sandy loam, sandy loam, loam	SM, ML	A-4	0	0	100	100	60-90	35-75	20-25	NP-5
	13-32	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	#	10	40	200		
	In				Pct	Pct					Pct	
94C: Busby-----	32-60	Loamy fine sand, loamy sand, fine sandy loam	SM	A-2, A-4	0	0	100	100	60-85	20-50	15-25	NP-5
94D: Busby-----	0-5	Fine sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	5-13	Fine sandy loam, sandy loam, loam	SM, ML	A-4	0	0	100	100	60-90	35-75	20-25	NP-5
	13-32	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	32-60	Loamy fine sand, loamy sand, fine sandy loam	SM	A-2, A-4	0	0	100	100	60-85	20-50	15-25	NP-5
96C: Macar-----	0-5	Loam	CL-ML	A-4	0	0	100	100	75-95	55-70	25-30	5-10
	5-12	Clay loam, loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	75-95	60-85	25-40	5-15
	12-60	Stratified sandy clay loam to silt loam	CL-ML, CL	A-6, A-4	0	0	90-100	85-100	70-90	50-75	25-35	5-15
96D: Macar-----	0-5	Loam	CL-ML	A-4	0	0	100	100	75-95	55-70	25-30	5-10
	5-12	Clay loam, loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	75-95	60-85	25-40	5-15
	12-60	Stratified sandy clay loam to silt loam	CL-ML, CL	A-6, A-4	0	0	90-100	85-100	70-90	50-75	25-35	5-15
98B: Kremlin-----	0-7	Loam	CL-ML	A-4	0	0	95-100	90-100	75-95	50-75	25-30	5-10
	7-16	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	75-95	55-80	25-35	5-15
	16-40	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	75-95	55-80	25-35	5-15
	40-60	Stratified sandy loam to silt loam	ML, CL-ML	A-4	0	0	90-100	85-100	70-90	50-75	20-30	NP-10
101A: Hanly-----	0-4	Loamy sand	SM	A-2	0	0	100	100	50-75	15-30	---	NP
	4-60	Stratified fine sandy loam to sand	SM, SP-SM	A-2, A-3	0	0	100	100	50-85	5-25	---	NP

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
101A: Glendive-----	0-8	Fine sandy loam	SM, ML	A-2, A-4	0	0	100	100	65-85	30-55	15-20	NP-5
	8-60	Stratified loamy fine sand to clay loam	SM, SC-SM	A-2, A-4	0	0	95-100	75-100	60-90	25-50	15-25	NP-10
Havre-----	0-6	Loam	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	6-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	60-80	20-35	5-15
110A: Korchea-----	0-6	Loam	CL-ML, CL	A-4	0	0	100	100	85-95	60-75	25-30	5-10
	6-60	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4	0	0	100	100	85-95	60-75	25-30	5-10
Kiwanis-----	0-5	Fine sandy loam	SM	A-2, A-4	0	0	95-100	95-100	75-90	30-45	20-25	NP-5
	5-36	Fine sandy loam, sandy loam, loam	ML, SM	A-4	0	0	90-100	85-100	70-85	40-55	---	NP
	36-60	Coarse sand, gravelly coarse sand, very gravelly sand	SP, GP, SP-SM, GP-GM	A-1	0	0-15	30-100	25-100	10-50	0-10	---	NP
141A: McKenzie-----	0-4	Clay	CH	A-7	0	0	100	100	90-100	80-95	50-75	25-50
	4-60	Clay	CH	A-7	0	0	100	100	90-100	75-95	50-75	25-50
143A: Meadowcreek-----	0-9	Loam	CL-ML	A-4	0	0	95-100	90-100	70-95	50-75	20-30	5-10
	9-16	Silt loam	CL-ML	A-4	0	0	95-100	90-100	80-100	65-90	20-30	5-10
	16-21	Loam, sandy loam, silt loam	SC-SM, CL-ML	A-4	0	0	95-100	90-100	70-90	40-75	20-30	5-10
	21-60	Very gravelly sand, extremely gravelly sand, very gravelly loamy sand	GP, GP-GM	A-1	0	0-10	25-45	15-35	10-25	0-10	---	NP
144A: Bigsandy-----	0-5	Silty clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-40	10-15
	5-10	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-100	50-90	25-40	5-15
	10-32	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-100	50-90	25-40	5-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
144A: Bigsandy-----	32-60	Stratified fine sand to clay	CL-ML, CL	A-4, A-6	0	0	100	100	75-95	50-85	25-40	5-15
162B: Degrand-----	0-5	Sandy loam	SM	A-2, A-4	0	0-5	85-100	80-100	50-80	25-50	20-30	NP-5
	5-24	Sandy clay loam, clay loam	CL, SC, CL-ML, SC-SM	A-6, A-4	0	0-5	85-100	80-100	50-90	35-80	25-40	5-15
	24-60	Sand, gravelly sand, loamy sand	SP, SP-SM, SM	A-1, A-3, A-2	0	0-5	65-100	55-100	25-70	0-15	---	NP
171F: Delpoint-----	0-2	Clay loam	CL	A-6	0	0	95-100	90-100	80-95	65-85	30-40	5-20
	2-11	Loam, clay loam	CL-ML, CL	A-4, A-6	0	0	95-100	90-100	80-95	65-85	20-40	5-20
	11-24	Loam, clay loam, silt loam	CL-ML, CL	A-4, A-6	0	0	90-100	85-100	75-90	60-80	20-40	5-20
	24-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Cabbart-----	0-4	Clay loam	CL	A-6	0	0	90-100	85-100	70-90	60-80	30-35	10-15
	4-16	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	60-90	55-85	25-35	5-15
	16-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
181D: Doney-----	0-5	Clay loam	CL	A-6	0	0	85-100	75-100	65-95	60-90	30-40	10-20
	5-32	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	85-100	75-100	65-95	55-85	25-35	5-15
	32-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Cabba-----	0-6	Loam	ML, CL-ML	A-4	0	0-5	90-100	85-100	70-90	60-80	20-30	NP-10
	6-15	Clay loam, silty clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	15-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
191B: Kenilworth-----	0-6	Fine sandy loam	ML, SM	A-4	0	0	100	100	70-85	40-55	15-25	NP-5
	6-11	Fine sandy loam, sandy clay loam	CL-ML, SC-SM	A-4	0	0	100	100	75-90	35-55	20-30	5-10
	11-15	Sandy clay loam, clay loam	CL, SC	A-6	0	0	100	100	85-95	45-75	25-35	10-15
	15-24	Clay loam, silty clay loam	CL	A-6	0	0	95-100	90-100	80-100	70-90	30-40	10-20

[illegible]

[illegible]

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
224E:												
Hillon-----	0-5	Loam	ML, CL, CL-ML	A-4, A-6	0	0-5	85-100	80-100	80-90	65-75	20-35	NP-15
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Joplin-----	0-4	Loam	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
241C:												
Marmarth-----	0-3	Loam	CL-ML, CL	A-4	0	0	100	100	85-95	60-80	25-30	5-10
	3-11	Clay loam, loam, sandy clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	60-80	25-40	5-20
	11-32	Loam, fine sandy loam, clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	60-80	25-35	5-15
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
Evanston-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-90	65-70	25-35	5-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
251C:												
Bascovy-----	0-4	Clay loam	CL	A-7, A-6	0	0	90-100	75-100	70-95	60-90	35-45	15-25
	4-13	Clay, silty clay	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	13-30	Clay, silty clay	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	30-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
252D:												
Bascovy-----	0-4	Clay	CH, CL	A-7	0	0	90-100	75-100	70-95	60-95	40-60	20-35
	4-13	Clay, silty clay	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45
	13-30	Clay, silty clay	CH	A-7	0	0	90-100	75-100	70-95	60-95	50-70	25-45



## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
252D: Bascovy-----	30-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Neldore-----	0-6	Clay	CL, CH	A-7	0	0-10	95-100	90-100	75-100	70-95	40-55	20-30
	6-18	Clay, silty clay	CL, CH	A-7	0	0	90-100	85-100	70-95	65-90	40-60	20-40
	18-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
261A: Absher-----	0-6	Clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-35
	6-13	Silty clay, clay, clay loam	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-40
	13-60	Clay loam, clay, silty clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-55	20-35
Nobe-----	0-1	Clay loam	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-20
	1-17	Silty clay, clay, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	20-35
	17-60	Stratified loam to clay	CL, CH	A-7, A-6	0	0	100	100	85-100	75-90	35-55	15-30
272B: Attewan-----	0-4	Sandy loam	SM	A-4, A-2	0	0-5	85-100	80-100	60-80	30-50	15-25	NP-5
	4-12	Clay loam, sandy clay loam, gravelly loam	CL, SC	A-6	0	0-5	75-100	70-100	55-85	35-70	30-40	10-20
	12-27	Clay loam, gravelly loam, sandy clay loam	CL, SC, GC	A-6	0	0-5	70-100	65-100	50-85	35-65	30-40	10-20
	27-60	Very gravelly loamy sand, extremely gravelly loamy sand, very gravelly sand	GP, GP-GM, GM, SM	A-1	0	0-15	25-55	15-50	5-20	0-15	---	NP
300F: Rubble land.												
311B: Creed-----	0-5	Clay loam	CL	A-6	0	0	85-100	75-100	70-95	65-85	25-35	10-15
	5-12	silty clay, clay, silty clay loam	CL, CH	A-6, A-7	0	0	90-100	75-100	70-100	60-95	35-60	15-35
	12-60	Stratified loam to silty clay loam	CL	A-6, A-7	0	0	90-100	75-100	65-100	50-90	30-45	10-20

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
311B:												
Gerdrum-----	0-4	Clay loam	CL	A-6	0	0	80-100	75-100	65-95	60-90	25-40	10-20
	4-14	Clay, silty clay, silty clay loam	CL, CH	A-7	0	0	90-100	90-100	85-100	75-95	40-60	20-40
	14-60	Gravelly sandy loam	SM, GM	A-2, A-1	0	0	60-85	50-75	30-55	15-30	20-30	NP-5
Absher-----	0-6	Clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-35
	6-13	Silty clay, clay, clay loam	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-40
	13-60	Clay loam, clay, silty clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-55	20-35
321B:												
Kobase-----	0-12	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	12-28	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
	28-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
321C:												
Kobase-----	0-12	Silty clay loam	CL	A-7, A-6	0	0	95-100	90-100	85-100	80-95	30-45	10-20
	12-28	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
	28-60	Silty clay loam, silty clay, clay	CL	A-7, A-6	0	0	95-100	90-100	85-100	75-95	35-45	15-25
323C:												
Sagedale-----	0-5	Silty clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-40	10-20
	5-12	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25
	12-35	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25
	35-60	Silty clay loam, silty clay, gravelly clay loam	CL	A-6, A-7	0	0	75-100	70-100	65-100	60-95	35-45	15-25
331B:												
Phillips-----	0-7	Clay loam	CL	A-6	0	0-5	85-100	80-100	80-100	60-80	30-40	10-15
	7-16	Clay, clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-95	60-85	35-50	15-25
	16-42	Clay loam, loam	CL	A-6, A-7	0	0-5	85-100	80-100	75-100	55-80	30-45	10-20
	42-60	Clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	85-100	80-100	70-90	55-75	25-40	5-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
331B:												
Elloam-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	4-15	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	15-25	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	25-60	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
332B:												
Phillips-----	0-7	Clay loam	CL	A-6	0	0-5	85-100	80-100	80-100	60-80	30-40	10-15
	7-16	Clay, clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-95	60-85	35-50	15-25
	16-42	Clay loam, loam	CL	A-6, A-7	0	0-5	85-100	80-100	75-100	55-80	30-45	10-20
	42-60	Clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	85-100	80-100	70-90	55-75	25-40	5-15
Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
364C:												
Chinook-----	0-6	Fine sandy loam	SM	A-4, A-2	0	0	80-100	75-100	65-85	30-50	15-25	NP-5
	6-23	Fine sandy loam, sandy loam	SM	A-4, A-2	0	0	80-100	75-100	55-85	30-50	15-25	NP-5
	23-60	Fine sandy loam, loamy fine sand, sandy loam	SM	A-4, A-2	0	0	80-100	75-100	60-80	25-45	15-25	NP-5
372B:												
Evanston-----	0-6	Fine sandy loam	ML, CL-ML, SC-SM, SM	A-4	0	0-5	95-100	95-100	65-85	40-55	20-30	NP-10
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
373C:												
Evanston-----	0-6	Clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-80	30-40	10-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
373C: Tinsley-----	0-4	Gravelly sandy loam	SM	A-2, A-1	0	0-10	70-90	55-75	35-55	15-35	15-20	NP-5
	4-60	Very gravelly sand, very cobbly loamy sand, extremely gravelly sand	GM, SM, SP-SM, GP-GM	A-1	0	10-40	40-70	25-55	10-35	5-15	---	NP
374B: Evanston-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-90	65-70	25-35	5-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
374C: Evanston-----	0-6	Loam	CL, CL-ML	A-4, A-6	0	0-5	95-100	95-100	85-90	65-70	25-35	5-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
378B: Evanston-----	0-6	Clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-80	30-40	10-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
Evanston, calcareous-----	0-6	Clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-80	30-40	10-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
379C:												
Evanston-----	0-6	Clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-80	30-40	10-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15
Busby-----	0-5	Fine sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	5-13	Fine sandy loam, sandy loam, loam	SM, ML	A-4	0	0	100	100	60-90	35-75	20-25	NP-5
	13-32	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	32-60	Loamy fine sand, loamy sand, fine sandy loam	SM	A-2, A-4	0	0	100	100	60-85	20-50	15-25	NP-5
384B:												
Ethridge-----	0-6	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	25-45	10-20
	6-15	Silty clay, silty clay loam, clay	CL	A-7	0	0	100	95-100	95-100	90-95	40-50	20-30
	15-38	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	35-50	15-30
	38-60	Silty clay loam, clay loam, silt loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	30-50	10-25
386B:												
Ethridge-----	0-6	Clay loam	CL	A-6	0	0	100	95-100	85-100	70-80	25-40	10-20
	6-15	Silty clay, silty clay loam, clay	CL	A-7	0	0	100	95-100	95-100	90-95	40-50	20-30
	15-38	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	35-50	15-30
	38-60	Silty clay loam, clay loam, silt loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	30-50	10-25
Evanston-----	0-6	Clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-80	30-40	10-15
	6-15	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	15-32	Clay loam, loam, silty clay loam	CL	A-6	0	0-5	95-100	95-100	85-100	65-85	25-35	10-15
	32-60	Loam, clay loam, fine sandy loam	CL	A-6	0	0-5	95-100	95-100	70-90	50-75	25-35	10-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
391B: Ferd-----	0-5	Loam	CL-ML, CL	A-4	0	0	100	95-100	80-95	55-75	25-30	5-10
	5-9	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-95	70-90	25-40	5-15
	9-16	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	85-100	70-90	35-50	15-30
	16-41	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
	41-60	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
Creed-----	0-5	Loam	CL-ML, SC-SM	A-4	0	0	90-100	75-100	65-95	45-75	20-30	5-10
	5-12	Silty clay, clay, silty clay loam	CL, CH	A-6, A-7	0	0	90-100	75-100	70-100	60-95	35-60	15-35
	12-60	Stratified loam to silty clay loam	CL	A-6, A-7	0	0	90-100	75-100	65-100	50-90	30-45	10-20
Gerdum-----	0-4	Clay loam	CL	A-6	0	0	80-100	75-100	65-95	60-90	25-40	10-20
	4-14	Clay, silty clay, silty clay loam	CL, CH	A-7	0	0	90-100	90-100	85-100	75-95	40-60	20-40
	14-60	Gravelly sandy loam	SM, GM	A-2, A-1	0	0	60-85	50-75	30-55	15-30	20-30	NP-5
391C: Ferd-----	0-5	Loam	CL-ML, CL	A-4	0	0	100	95-100	80-95	55-75	25-30	5-10
	5-7	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-95	70-90	25-40	5-15
	7-16	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	85-100	70-90	35-50	15-30
	16-41	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
	41-60	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
Creed-----	0-5	Loam	CL-ML, SC-SM	A-4	0	0	90-100	75-100	65-95	45-75	20-30	5-10
	5-12	Silty clay, clay, silty clay loam	CL, CH	A-6, A-7	0	0	90-100	75-100	70-100	60-95	35-60	15-35
	12-60	Stratified loam to silty clay loam	CL	A-6, A-7	0	0	90-100	75-100	65-100	50-90	30-45	10-20

[illegible]

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
421C:												
Joplin-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Hillon-----	0-5	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
421D:												
Joplin-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Hillon-----	0-5	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
423B:												
Joplin, calcareous----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Hillon-----	0-5	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
423C:												
Hillon-----	0-5	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Joplin, calcareous----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15



## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
424C: Joplin-----	0-4	Gravelly loam	CL-ML, ML, GM-GC, GM	A-4, A-2	0	0-5	60-85	55-75	45-70	30-55	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam	CL-ML, CL, GM-GC, GC	A-4, A-6, A-2	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam	CL-ML, CL, GM-GC, GC	A-4, A-6, A-2	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Hillon-----	0-5	Gravelly loam	GM, GM-GC, CL-ML, ML	A-4	0	0-5	60-80	55-75	45-70	35-55	20-30	NP-10
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20
425C: Joplin, calcareous----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Telstad-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	70-95	55-80	30-35	10-15
	5-19	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	19-37	Clay loam, loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	37-60	Loam, clay loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
426B: Joplin-----	0-4	Loam	CL-ML, ML	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
427B:												
Joplin-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Joplin, calcareous-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
427C:												
Joplin-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
Joplin, calcareous-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
441C:												
Kevin-----	0-4	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	4-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-26	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	26-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Millon-----	0-5	Clay loam	CL	A-6	0	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	5-60	Loam, clay loam	CL	A-6	0	0-5	85-100	80-100	80-90	65-80	25-35	10-20

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
443B:												
Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Ferd-----	0-5	Loam	CL-ML, CL	A-4	0	0	100	95-100	80-95	55-75	25-30	5-10
	5-9	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-95	70-90	25-40	5-15
	9-16	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	85-100	70-90	35-50	15-30
	16-41	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
	41-60	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
444B:												
Kevin, calcareous-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Ferd-----	0-5	Loam	CL-ML, CL	A-4	0	0	100	95-100	80-95	55-75	25-30	5-10
	5-9	Loam, clay loam, silty clay loam	CL, CL-ML	A-4, A-6	0	0	100	95-100	85-95	70-90	25-40	5-15
	9-16	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	85-100	70-90	35-50	15-30
	16-41	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
	41-60	Clay loam, silty clay loam	CL	A-6	0	0	100	95-100	85-100	70-90	30-40	10-20
445B:												
Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Kevin, calcareous-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
445C: Kevin, calcareous-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
446C: Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
Elloam-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	4-15	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	15-25	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	25-60	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
451A: Cozberg-----	0-8	Fine sandy loam	SM	A-4	0	0	95-100	95-100	70-85	35-50	20-30	NP-5
	8-18	Fine sandy loam, very fine sandy loam, sandy loam	SM, ML	A-4	0	0	95-100	80-100	60-90	35-60	20-30	NP-5
	18-60	Loamy sand, sand, gravelly loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0	60-100	50-95	25-70	5-30	---	NP
Lihen-----	0-10	Fine sandy loam	SM	A-4	0	0	100	85-100	60-80	35-50	20-25	NP-5
	10-60	Loamy fine sand, loamy sand, sand	SM A-1	A-2, A-1	0	0	100	85-100	45-75	15-35	---	NP
451C: Cozberg-----	0-8	Fine sandy loam	SM	A-4	0	0	95-100	95-100	70-85	35-50	20-30	NP-5
	8-18	Fine sandy loam, very fine sandy loam, sandy loam	SM, ML	A-4	0	0	95-100	80-100	60-90	35-60	20-30	NP-5
	18-60	Loamy sand, sand, gravelly loamy sand	SM, SP-SM	A-1, A-2, A-3	0	0	60-100	50-95	25-70	5-30	---	NP
Lihen-----	0-10	Fine sandy loam	SM	A-4	0	0	100	85-100	60-80	35-50	20-25	NP-5
	10-60	Loamy fine sand, loamy sand, sand	SM A-1	A-2, A-1	0	0	100	85-100	45-75	15-35	---	NP

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
481A: Bigsag-----	0-2	Silty clay	CL, CH	A-7	0	0	100	100	95-100	90-95	40-60	20-40
	2-16	Silty clay, clay, silty clay loam	CL, CH	A-7	0	0	100	100	90-100	75-95	40-60	20-40
	16-60	Silty clay, clay, silty clay loam	CL, CH	A-7	0	0	100	100	90-100	75-95	40-60	20-40
482A: Vanda-----	0-9	Clay	CL, CH	A-7	0	0	100	100	95-100	75-95	40-65	20-45
	9-60	Clay, silty clay, silty clay loam	CL, CH	A-7, A-6	0	0	100	100	95-100	80-95	35-65	15-45
Marvan-----	0-7	Clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-70	25-50
	7-30	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
	30-60	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-100	45-70	25-50
503B: Telstad-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	70-95	55-80	30-35	10-15
	5-19	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	19-37	Clay loam, loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	37-60	Loam, clay loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
Joplin-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
503C: Telstad-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	70-95	55-80	30-35	10-15
	5-19	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20
	19-37	Clay loam, loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15
	37-60	Loam, clay loam	CL-ML, CL	A-6, A-4	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15
Joplin-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	95-100	90-100	70-80	30-40	10-15
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15
	9-26	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15
	26-60	Loam, gravelly loam, clay loam	CL-ML, CL, GM-GC, SC	A-4, A-6	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index		
			Unified	AASHTO	>10 inches	3-10 inches								
							4	10	40	200				
	In				Pct	Pct					Pct			
504B:														
Telstad-----	0-5	Loam	CL-ML	A-4	0	0-5	85-100	80-100	65-90	50-70	25-30	5-10		
	5-19	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20		
	19-37	Clay loam, loam	CL-ML,	A-6,	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15		
			CL	A-4										
	37-60	Loam, clay loam	CL-ML,	A-6,	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15		
			CL	A-4										
Joplin-----	0-4	Loam	CL-ML,	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10		
			ML											
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15		
	9-26	Loam, gravelly	CL-ML,	A-4,	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15		
		loam, clay	CL,	A-6										
		loam	GM-GC,											
			SC											
	26-60	Loam, gravelly	CL-ML,	A-4,	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15		
		loam, clay	CL,	A-6										
		loam	GM-GC,											
			SC											
504C:														
Telstad-----	0-5	Loam	CL-ML	A-4	0	0-5	85-100	80-100	65-90	50-70	25-30	5-10		
	5-19	Clay loam, loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-80	30-40	10-20		
	19-37	Clay loam, loam	CL-ML,	A-6,	0	0-5	95-100	90-100	80-95	60-80	25-35	5-15		
			CL	A-4										
	37-60	Loam, clay loam	CL-ML,	A-6,	0	0-5	95-100	90-100	75-90	55-75	25-35	5-15		
			CL	A-4										
Joplin-----	0-4	Loam	CL-ML,	A-4	0	0-5	95-100	95-100	85-90	60-75	25-35	5-10		
			ML											
	4-9	Loam, clay loam	CL	A-6	0	0-5	95-100	90-100	80-95	60-75	30-40	10-15		
	9-26	Loam, gravelly	CL-ML,	A-4,	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15		
		loam, clay	CL,	A-6										
		loam	GM-GC,											
			SC											
	26-60	Loam, gravelly	CL-ML,	A-4,	0	0-5	70-95	65-95	60-90	40-75	25-40	5-15		
		loam, clay	CL,	A-6										
		loam	GM-GC,											
			SC											
511C:														
Turner-----	0-5	Sandy loam	SM	A-2,	0	0-10	80-100	75-100	50-80	30-50	20-25	NP-5		
				A-4										
	5-15	Clay loam,	CL,	A-6	0	0-10	65-100	60-100	55-90	35-70	30-40	10-20		

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
521B:												
Elloam-----	0-4	Clay loam	CL	A-6	0	0-5	95-100	80-100	70-100	55-80	30-40	10-15
	4-15	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	70-100	55-90	35-50	15-30
	15-25	Clay loam, clay	CL	A-6, A-7	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
	25-60	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	80-100	65-100	50-80	30-45	10-20
Absher-----	0-6	Clay loam	CL	A-6	0	0	95-100	75-100	70-100	60-90	25-40	10-20
	6-13	Silty clay, clay, clay loam	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-60	20-40
	13-60	Clay loam, clay, silty clay	CL, CH	A-7	0	0	95-100	75-100	70-100	60-95	40-55	20-35
551E:												
Lihen-----	0-10	Loamy sand	SM	A-2, A-1	0	0	100	85-100	45-75	15-30	---	NP
	10-60	Loamy fine sand, loamy sand, sand	SM	A-2, A-1	0	0	100	85-100	45-75	15-35	---	NP
Blanchard-----	0-6	Loamy sand	SM	A-2	0	0	100	100	50-75	15-30	---	NP
	6-60	Fine sand, loamy sand, loamy fine sand	SM	A-2	0	0	100	100	60-85	15-35	---	NP
561B:												
Scobey-----	0-6	Clay loam	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-12	Clay, clay loam	CL	A-7, A-6	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30
	12-60	Clay loam	CL	A-6, A-7	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25
Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
561C:												
Scobey-----	0-6	Clay loam	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-12	Clay, clay loam	CL	A-7, A-6	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30
	12-60	Clay loam	CL	A-6, A-7	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25
Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	5-9	Clay loam, clay	CL	A-6, A-7	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index		
			Unified	AASHTO	>10	3-10								
					inches	inches	4	10	40	200				
	In				Pct	Pct					Pct			
561D:														
Scobey-----	0-6	Clay loam	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20		
	6-12	Clay, clay loam	CL	A-7,	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30		
				A-6										
	12-60	Clay loam	CL	A-6,	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25		
				A-7										
Kevin-----	0-5	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	25-40	10-20		
	5-9	Clay loam, clay	CL	A-6,	0	0-5	90-100	85-100	80-95	70-80	35-50	15-25		
				A-7										
	9-24	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20		
	24-60	Clay loam	CL	A-6	0	0-5	90-100	85-100	80-95	70-80	30-40	10-20		
563B:														
Scobey,														
calcareous----	0-6	Clay loam	CL	A-6	0	0-5	85-100	75-95	70-90	65-80	25-40	10-20		
	6-12	Clay, clay loam	CL	A-7,	0	0-5	85-100	85-95	80-95	65-90	35-50	15-30		
				A-6										
	12-60	Clay loam	CL	A-6,	0	0-5	85-100	75-95	70-90	65-80	35-45	15-25		
				A-7										
571A:														
Ryell-----	0-5	Loam	CL-ML	A-4	0	0	100	95-100	75-95	60-80	25-30	5-10		
	5-26	Stratified	ML	A-4	0	0	100	95-100	85-95	60-80	20-25	NP-5		
		very fine												
		sandy loam to												
		silt loam												
	26-60	Extremely	GP-GM,	A-1	0	0-5	30-50	20-45	10-30	0-10	---	NP		
		gravelly loamy	GP											
		sand, very												
		gravelly sand,												
		extremely												
		gravelly sand,												
		very gravelly												
		sand												
Rivra-----	0-5	Gravelly sandy	SM	A-1,	0	0-15	65-80	60-75	40-60	20-35	20-25	NP-5		
		loam		A-2										
	5-60	Very gravelly	GP,	A-1	0	15-30	25-55	15-45	5-25	0-10	---	NP		
		loamy coarse	GP-GM											
		sand,												
		extremely												
		gravelly sand,												
		very gravelly												
		sand												
572A:														
Ryell-----	0-5	Loam	CL-ML	A-4	0	0	100	95-100	75-95	60-80	25-30	5-10		
	5-26	Stratified	ML	A-4	0	0								



## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
572A:												
Havre-----	0-6	Loam	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	6-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	70-95	60-80	20-35	5-15
581B:												
Lonna-----	0-5	Silty clay loam	CL	A-6	0	0	100	100	90-100	75-90	30-40	10-20
	5-11	Silt loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	11-60	Silty clay loam, silt loam, very fine sandy loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-90	25-35	5-15
581C:												
Lonna-----	0-5	Silty clay loam	CL	A-6	0	0	100	100	90-100	75-90	30-40	10-20
	5-11	Silt loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	11-60	Silty clay loam, silt loam, very fine sandy loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-90	25-35	5-15
582B:												
Lonna-----	0-5	Silt loam	CL-ML	A-4	0	0	100	100	90-100	75-90	25-30	5-10
	5-11	Silt loam, silty clay loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-95	25-40	5-15
	11-60	Silty clay loam, silt loam, very fine sandy loam	CL-ML, CL	A-6, A-4	0	0	100	100	95-100	75-90	25-35	5-15
Ethridge-----	0-6	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	25-45	10-20
	6-15	Silty clay, silty clay loam, clay	CL	A-7	0	0	100	95-100	95-100	90-95	40-50	20-30
	15-38	Clay loam, silty clay loam, clay	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	35-50	15-30
	38-60	Silty clay loam, clay loam, silt loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-95	30-50	10-25
601A:												
Havre-----	0-6	Loam	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	6-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-95	60-80	20-35	5-15

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
601A: Glendive-----	0-8	Fine sandy loam	SM, ML	A-2, A-4	0	0	100	100	65-85	30-55	15-20	NP-5
	8-60	Stratified loamy fine sand to clay loam	SM, SC-SM	A-2, A-4	0	0	95-100	75-100	60-90	25-50	15-25	NP-10
603A: Havre-----	0-6	Loam	CL-ML	A-4	0	0	100	100	80-95	60-90	20-30	5-10
	6-60	Stratified fine sandy loam to clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	70-95	60-80	20-35	5-15
Glendive-----	0-5	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4, A-2	0	0	100	100	65-85	30-55	20-30	NP-10
	5-16	Loam, silt loam, sandy loam	ML, CL-ML, SM, SC-SM	A-4	0	0	100	100	65-95	40-70	15-30	NP-10
	16-60	Stratified loamy fine sand to silt loam	SM, SC-SM	A-2, A-4	0	0	95-100	75-100	60-80	25-50	15-25	NP-10
651E: Fleak-----	0-4	Fine sandy loam	SM, SC-SM	A-4	0	0-5	95-100	95-100	65-80	35-50	15-25	NP-5
	4-18	Fine sand, loamy fine sand	SM	A-2	0	0-5	95-100	95-100	70-85	20-35	---	NP
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---	NP
Lihen-----	0-10	Fine sandy loam	SM	A-4	0	0	100	85-100	60-80	35-50	20-25	NP-5
	10-60	Loamy fine sand, loamy sand, sand	SM	A-2, A-1	0	0	100	85-100	45-75	15-35	---	NP
673B: Bearpaw-----	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-13	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	13-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
Daglum-----	0-9	Clay loam	CL	A-6	0	0-5	85-100	80-100	70-100	55-80	30-40	10-20
	9-19	Clay, clay loam	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	20-40
	19-60	Clay, clay loam	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	20-40

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
691B:												
Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Vida, calcareous-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Williams-----	0-5	Clay loam	CL	A-6	0	0-5	95-100	85-100	80-90	70-85	25-35	10-15
	5-13	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	13-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
691C:												
Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Vida, calcareous-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Williams-----	0-5	Clay loam	CL	A-6	0	0-5	95-100	85-100	80-90	70-85	25-35	10-15
	5-13	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	13-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
692D:												
Vida, calcareous-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Williams-----	0-5	Clay loam	CL	A-6	0	0-5	95-100	85-100	80-90	70-85	25-35	10-15
	5-13	Clay loam, loam	CL-ML, CL	A-4, A-6	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
	13-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
Zahill-----	0-5	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	5-20	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	20-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
694C:												
Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
694C:												
Williams-----	0-5	Clay loam	CL	A-6	0	0-5	95-100	85-100	80-90	70-85	25-35	10-15
	5-13	Clay loam, loam	CL-ML,	A-4,	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
			CL	A-6								
	13-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
695D:												
Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Williams-----	0-5	Clay loam	CL	A-6	0	0-5	95-100	85-100	80-90	70-85	25-35	10-15
	5-13	Clay loam, loam	CL-ML,	A-4,	0	0-5	95-100	85-100	80-95	70-90	25-35	5-15
			CL	A-6								
	13-60	Clay loam, loam, gravelly clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	75-100	65-80	55-70	25-35	5-15
Zahill-----	0-5	Clay loam	CL,	A-6,	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
			CL-ML	A-4								
	5-20	Clay loam, loam	CL,	A-4,	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
			CL-ML	A-6								
	20-60	Clay loam, loam	CL,	A-4,	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
			CL-ML	A-6								
696E:												
Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Zahill-----	0-5	Clay loam	CL,	A-6,	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
			CL-ML	A-4								
	5-20	Clay loam, loam	CL,	A-4,	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
			CL-ML	A-6								
	20-60	Clay loam, loam	CL,	A-4,	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
			CL-ML	A-6								
697C:												
Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20
Bearpaw-----	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20
	6-13	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40
	13-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35
698D:												
Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index			
			Unified	AASHTO	>10 inches	3-10 inches	4						10	40	200
	In				Pct	Pct					Pct				
698D: Bearpaw-----	0-6	Clay loam	CL	A-6, A-7	0	0-5	85-100	80-100	70-100	55-80	30-45	10-20			
	6-13	Clay loam, clay	CL, CH	A-7	0	0-5	85-100	80-100	70-100	60-90	40-65	15-40			
	13-20	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35			
	20-60	Clay loam, silty clay loam, clay	CL, CH	A-6, A-7	0	0-5	85-100	80-100	70-100	55-85	35-60	15-35			
Nishon-----	0-4	Clay loam	CL	A-6, A-7	0	0	100	100	85-100	60-85	30-45	10-20			
	4-22	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-45			
	22-60	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-60	15-40			
698E: Vida-----	0-4	Clay loam	CL	A-6	0	0-10	90-100	85-100	75-95	60-80	25-35	10-15			
	4-9	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-85	30-40	10-20			
	9-60	Clay loam, loam	CL	A-6	0	0-10	90-100	85-100	70-95	50-80	25-40	10-20			
Zahill-----	0-5	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15			
	5-20	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15			
	20-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15			
Nishon-----	0-4	Clay loam	CL	A-6, A-7	0	0	100	100	85-100	60-85	30-45	10-20			
	4-22	Clay, silty clay	CL, CH	A-7	0	0	100	100	90-100	75-95	40-65	20-45			
	22-60	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	0	90-100	90-100	80-100	65-90	35-60	15-40			
721E: Zahill-----	0-5	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15			
	5-20	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15			
	20-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15			
Zahl-----	0-4	Loam	CL	A-6	0	0-1	95-100	95-100	80-95	55-75	25-40	10-20			
	4-8	Loam, clay loam	CL, CL-ML	A-6, A-4, A-7	0	0-1	90-100	85-100	80-95	55-80	25-50	5-30			
	8-60	Clay loam, loam	CL, CL-ML	A-6, A-4, A-7	0	0-1	90-100	85-100	80-95	55-80	25-50	5-30			
721F: Zahill-----	0-5	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15			
	5-20	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15			
	20-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15			

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
721F:												
Zahl-----	0-4	Loam	CL	A-6	0	0-1	95-100	95-100	80-95	55-75	25-40	10-20
	4-8	Loam, clay loam	CL, CL-ML	A-6, A-4, A-7	0	0-1	90-100	85-100	80-95	55-80	25-50	5-30
	8-60	Clay loam, loam	CL, CL-ML	A-6, A-4, A-7	0	0-1	90-100	85-100	80-95	55-80	25-50	5-30
722F:												
Zahill-----	0-5	Clay loam	CL, CL-ML	A-6, A-4	0	0-10	90-100	85-100	85-95	70-80	25-40	5-15
	5-20	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
	20-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0	0-10	90-100	85-100	80-95	60-80	25-40	5-15
Dast-----	0-5	Fine sandy loam	SM, ML	A-4, A-2	0	0	80-100	75-100	65-90	30-55	15-25	NP-5
	5-30	Fine sandy loam, sandy loam, loam	SM, ML	A-4, A-2	0	0	80-100	75-100	55-85	30-55	15-25	NP-5
	30-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
Cabba-----	0-6	Fine sandy loam	ML, SM	A-4	0	0-5	95-100	85-100	75-95	35-55	15-25	NP-5
	6-15	Clay loam, silty clay loam, loam	CL, CL-ML	A-6, A-4	0	0-5	95-100	90-100	85-100	80-95	25-35	5-15
	15-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
743A:												
Shambo-----	0-6	Loam	CL-ML	A-4	0	0	100	100	85-100	65-90	25-30	5-10
	6-15	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	85-100	65-90	25-35	5-15
	15-60	Gravelly sandy loam	SM	A-2, A-1	0	0	85-100	55-75	35-55	15-30	20-25	NP-5
Fairway-----	0-10	Loam	CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	10-30	Silt loam, loam	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	20-35	5-15
	30-41	Silty clay loam, loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-95	20-40	5-15
	41-60	Sand, gravelly loamy sand, very gravelly sand	GP-GM, SM, SP, SP-SM	A-2, A-1	0	0-10	40-100	30-100	20-60	0-15	---	NP
761B:												
Fairway-----	0-10	Loam	CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	10-30	Silt loam, loam	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	20-35	5-15
	30-41	Silty clay loam, loam	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-95	20-40	5-15
	41-60	Sand, gravelly loamy sand, very gravelly sand	GP-GM, SM, SP, SP-SM	A-2, A-1	0	0-10	40-100	30-100	20-60	0-15	---	NP

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
761B: Bigsandy-----	0-5	Loam	CL-ML, ML	A-4	0	0	100	100	85-95	60-75	25-35	5-10
	5-10	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-100	50-90	25-40	5-15
	10-32	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-100	50-90	25-40	5-15
	32-60	Stratified fine sand to clay	CL-ML, CL	A-4, A-6	0	0	100	100	75-95	50-85	25-40	5-15
793B: Yamacall-----	0-6	Loam	CL-ML	A-4	0	0-5	85-100	80-100	65-85	55-75	25-30	5-10
	6-11	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
	11-60	Loam, fine sandy loam, silt loam	CL-ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-10
793C: Yamacall-----	0-6	Loam	CL-ML	A-4	0	0-5	85-100	80-100	65-85	55-75	25-30	5-10
	6-11	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
	11-60	Loam, fine sandy loam, silt loam	CL-ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-10
793D: Yamacall-----	0-6	Loam	CL-ML	A-4	0	0-5	85-100	80-100	65-85	55-75	25-30	5-10
	6-11	Loam, silt loam, clay loam	CL-ML, CL	A-4, A-6	0	0-5	85-100	80-100	60-85	55-75	25-35	5-15
	11-60	Loam, fine sandy loam, silt loam	CL-ML, SM	A-4, A-2	0	0-5	75-100	70-100	50-80	25-55	15-25	NP-10
831B: Enbar-----	0-18	Loam	CL-ML	A-4	0	0	80-100	75-100	60-85	50-75	20-30	5-10
	18-30	Loam, clay loam	CL-ML	A-4	0	0	80-100	75-100	65-90	55-80	20-30	5-10
	30-50	Loam, sandy loam	CL-ML, ML	A-4	0	0	80-100	75-100	60-85	50-75	20-30	NP-10
	50-60	Very gravelly sandy loam, very gravelly loamy sand, extremely gravelly sandy loam	GM, GP-GM	A-2, A-1	0	0-10	25-60	15-50	10-40	5-30	15-25	NP-5

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
831B: Bigsandy-----	0-5	Loam	CL-ML, ML	A-4	0	0	100	100	85-95	60-75	25-35	5-10
	5-10	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-100	50-90	25-40	5-15
	10-32	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4, A-6	0	0	100	100	80-100	50-90	25-40	5-15
	32-60	Stratified fine sand to clay	CL-ML, CL	A-4, A-6	0	0	100	100	75-95	50-85	25-40	5-15
Korchea-----	0-14	Loam	CL-ML, CL	A-4	0	0	100	100	85-95	60-75	25-30	5-10
	14-60	Stratified fine sandy loam to silty clay loam	CL-ML, CL	A-4	0	0	100	100	85-95	60-75	25-30	5-10
861F: Stemple-----	0-8	Very cobbly loam	GM-GC, GM	A-2, A-4	0	25-30	55-65	45-60	35-50	30-45	20-30	NP-10
	8-32	Very channery loam, very cobbly loam, extremely channery loam	GM-GC, GM	A-2, A-1	0	10-40	35-50	25-40	20-30	15-25	20-30	NP-10
	32-37	Very channery loam, very cobbly loam, extremely channery loam	GM-GC, GC	A-2	0	10-45	30-45	25-40	15-30	15-25	20-35	5-15
	37-60	Very channery clay loam, very cobbly clay loam, extremely channery clay loam	GC, GM-GC	A-2	0	15-45	25-40	20-40	10-30	10-30	25-40	5-15
Rubble land.												
862F: Stemple-----	0-8	Very cobbly loam	GM-GC, GM	A-2, A-4	0	25-30	55-65	45-60	35-50	30-45	20-30	NP-10
	8-32	Very channery loam, very cobbly loam, extremely channery loam	GM-GC, GM	A-2, A-1	0	10-40	35-50	25-40	20-30	15-25	20-30	NP-10
	32-37	Very channery loam, very cobbly loam, extremely channery loam	GM-GC, GC	A-2	0	10-45	30-45	25-40	15-30	15-25	20-35	5-15



## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
862F: Stomple-----	37-60	Very channery clay loam, very cobbly clay loam, extremely channery clay loam	GC, GM-GC	A-2	0	15-45	25-40	20-40	10-30	10-30	25-40	5-15
Rubble land.												
871B: Nesda-----	0-12	Gravelly loam	ML, SM, GM	A-2, A-4	0	0-5	60-80	55-75	40-65	25-55	15-25	NP-5
	12-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sand	GP, GM, GP-GM, SP-SM	A-1	0	0-25	25-60	15-50	5-40	0-20	---	NP
Nesda, cool-----	0-10	Very gravelly loam	GM	A-1, A-2	0	0-10	35-60	30-50	20-45	15-35	15-25	NP-5
	10-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sand	GP, GM, GP-GM, SP-SM	A-1	0	0-25	25-60	15-50	5-35	0-15	---	NP
881E: Perma-----	0-10	Cobbly loam	SM, SC-SM, ML, CL-ML	A-4	0	15-30	75-95	70-90	65-85	45-75	15-25	NP-10
	10-30	Very gravelly sandy loam, very cobbly loam, very cobbly sandy loam	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0	10-40	50-70	40-60	30-50	20-40	20-30	NP-10
	30-60	Extremely gravelly loamy sand, extremely cobbly sandy loam, extremely gravelly loam	GM, GP, GP-GM	A-1	0	15-40	20-40	10-30	5-25	0-15	15-25	NP-5
Whitlash-----	0-9	Cobbly loam	SM, SC-SM, ML, CL-ML	A-4	0	15-30	80-90	70-80	60-75	40-60	20-30	NP-10

## Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Rock Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
881E: Whitlash-----	9-19	Very cobbly loam, extremely cobbly loam, extremely cobbly sandy loam	SM, SC-SM, GM, GM-GC	A-2, A-1, A-4	0	40-65	50-80	45-75	30-65	20-50	20-30	NP-10
	19-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
881F: Perma-----	0-10	Cobbly loam	SM, SC-SM, ML, CL-ML	A-4	0	15-30	75-95	70-90	65-85	45-75	15-25	NP-10
	10-30	Very gravelly sandy loam, very cobbly loam, very cobbly sandy loam	GM-GC, GM, SC-SM, SM	A-2, A-4, A-1	0	10-40	50-70	40-60	30-50	20-40	20-30	NP-10
	30-60	Extremely gravelly loamy sand, extremely cobbly sandy loam, extremely gravelly loam	GM, GP, GP-GM	A-1	0	15-40	20-40	10-30	5-25	0-15	15-25	NP-5
Whitlash-----	0-9	Cobbly loam	SM, SC-SM, ML, CL-ML	A-4	0	15-30	80-90	70-80	60-75	40-60	20-30	NP-10
	9-19	Very cobbly loam, extremely cobbly loam, extremely cobbly sandy loam	SM, SC-SM, GM, GM-GC	A-2, A-1, A-4	0	40-65	50-80	45-75	30-65	20-50	20-30	NP-10
	19-60	Unweathered bedrock	---	---	---	---	---	---	---	---	---	NP
942C: Busby-----	0-5	Fine sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5
	5-13	Fine sandy loam, sandy loam, loam	SM, ML	A-4	0	0	100	100	60-90	35-75	20-25	NP-5
	13-32	Fine sandy loam, sandy loam	SM	A-4	0	0	100	100	60-85	35-50	20-25	NP-5

[illegible]

[illegible]

## Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer.)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
2A: Riverwash.											
4B: Brockway-----	0-6	18-27	1.10-1.30	0.60-2.00	0.18-0.20	Low	1.0-2.0	0.37	0.37	3	4L
	6-15	18-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-1.0	0.37	0.37		
	15-38	18-35	1.25-1.45	0.20-0.60	0.14-0.17	Low	0.0-0.5	0.37	0.37		
	38-60	18-35	1.40-1.60	0.20-0.60	0.16-0.19	Low	0.0-0.5	0.37	0.37		
4C: Brockway-----	0-6	18-27	1.10-1.30	0.60-2.00	0.18-0.20	Low	1.0-2.0	0.37	0.37	3	4L
	6-15	18-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-1.0	0.37	0.37		
	15-38	18-35	1.25-1.45	0.20-0.60	0.14-0.17	Low	0.0-0.5	0.37	0.37		
	38-60	18-35	1.40-1.60	0.20-0.60	0.16-0.19	Low	0.0-0.5	0.37	0.37		
12C: Tally-----	0-4	5-15	1.25-1.45	2.00-6.00	0.14-0.16	Low	1.0-3.0	0.20	0.20	4	3
	4-14	5-18	1.35-1.60	2.00-6.00	0.13-0.15	Low	1.0-2.0	0.20	0.20		
	14-42	5-18	1.40-1.65	2.00-6.00	0.11-0.13	Low	0.5-1.0	0.20	0.20		
	42-60	5-10	1.40-1.65	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.17	0.17		
12D: Tally-----	0-4	5-15	1.25-1.45	2.00-6.00	0.14-0.16	Low	1.0-3.0	0.20	0.20	4	3
	4-14	5-18	1.35-1.60	2.00-6.00	0.13-0.15	Low	1.0-2.0	0.20	0.20		
	14-42	5-18	1.40-1.65	2.00-6.00	0.11-0.13	Low	0.5-1.0	0.20	0.20		
	42-60	5-10	1.40-1.65	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.17	0.17		
13B: Tanna-----	0-6	27-35	1.10-1.30	0.06-0.20	0.14-0.18	Moderate	2.0-4.0	0.37	0.37	3	6
	6-15	35-45	1.30-1.50	0.06-0.20	0.14-0.17	Moderate	1.0-2.0	0.37	0.37		
	15-28	15-30	1.30-1.50	0.06-0.20	0.10-0.12	Low	0.5-1.0	0.20	0.37		
	28-60	---	---	---	---	---	---	---	---		
13C: Tanna-----	0-6	27-35	1.10-1.30	0.06-0.20	0.14-0.18	Moderate	2.0-4.0	0.37	0.37	3	6
	6-15	35-45	1.30-1.50	0.06-0.20	0.14-0.17	Moderate	1.0-2.0	0.37	0.37		
	15-28	15-30	1.30-1.50	0.06-0.20	0.10-0.12	Low	0.5-1.0	0.20	0.37		
	28-60	---	---	---	---	---	---	---	---		
14A: McKenzie-----	0-4	40-60	1.00-1.40	0.00-0.06	0.13-0.17	High	2.0-4.0	0.37	0.37	5	4
	4-24	40-60	1.20-1.60	0.00-0.06	0.13-0.17	High	1.0-2.0	0.28	0.28		
	24-60	40-60	1.20-1.60	0.00-0.06	0.13-0.17	High	---	0.28	0.28		
15F: Lambeth-----	0-4	20-27	1.20-1.40	0.20-0.60	0.18-0.22	Low	1.0-2.0	0.37	0.37	5	4L
	4-60	20-35	1.25-1.50	0.20-0.60	0.17-0.21	Moderate	0.0-1.0	0.37	0.37		
16B: Degrand-----	0-5	10-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	2.0-3.0	0.37	0.37	3	5
	5-24	20-35	1.40-1.60	0.60-2.00	0.13-0.16	Moderate	1.0-2.0	0.32	0.32		
	24-60	0-5	1.50-1.70	6.00-20.00	0.03-0.04	Low	0.0-0.5	0.10	0.15		
19B: Kenilworth-----	0-6	10-20	1.20-1.40	2.00-6.00	0.14-0.18	Low	1.0-2.0	0.43	0.43	5	5
	6-11	15-30	1.40-1.60	0.60-2.00	0.13-0.17	Low	1.0-1.5	0.37	0.37		
	11-15	20-35	1.40-1.60	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	15-24	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.30-1.50	0.06-0.20	0.16-0.20	Moderate	0.0-0.5	0.37	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
20C:											
Cabba-----	0-6	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	2	4L
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
20D:											
Cabba-----	0-6	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	2	4L
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
22E:											
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
22F:											
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
23A:											
Acel-----	0-5	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	7
	5-22	40-55	1.25-1.45	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	22-60	35-45	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.37	0.37		
26B:											
Absher-----	0-6	40-55	1.20-1.40	0.00-0.06	0.10-0.13	High	1.0-2.0	0.37	0.37	2	4
	6-13	35-60	1.35-1.60	0.00-0.06	0.08-0.10	High	0.5-1.0	0.37	0.37		
	13-60	35-50	1.30-1.55	0.00-0.06	0.05-0.07	High	0.0-0.5	0.43	0.43		
27B:											
Attewan-----	0-4	10-20	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	5
	4-12	20-35	1.40-1.60	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.32	0.32		
	12-27	15-30	1.40-1.60	0.60-2.00	0.13-0.15	Moderate	0.5-1.0	0.32	0.32		
	27-60	0-10	1.40-1.60	6.00-20.00	0.02-0.03	Low	0.0-0.5	0.05	0.24		
28A:											
Nishon-----	0-4	27-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	0.5-1.0	0.37	0.37	5	6
	4-22	40-60	1.30-1.50	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	22-60	35-55	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.32	0.32		
29B:											
Nunemaker-----	0-4	35-40	1.30-1.40	0.20-0.60	0.14-0.17	Moderate	1.0-3.0	0.32	0.32	5	4L
	4-12	45-55	1.50-1.60	0.00-0.06	0.12-0.15	High	0.5-1.0	0.43	0.43		
	12-60	35-50	1.65-1.75	0.06-0.20	0.12-0.15	High	0.0-0.5	0.43	0.43		
29C:											
Nunemaker-----	0-4	35-40	1.30-1.40	0.20-0.60	0.14-0.17	Moderate	1.0-3.0	0.32	0.32	5	4L
	4-12	45-55	1.50-1.60	0.00-0.06	0.12-0.15	High	0.5-1.0	0.43	0.43		
	12-60	35-50	1.65-1.75	0.06-0.20	0.12-0.15	High	0.0-0.5	0.43	0.43		
30B:											
Marvan-----	0-7	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37	5	4
	7-30	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	30-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
30C:											
Marvan-----	0-7	40-60	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37	5	4
	7-30	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	30-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
32B:											
Kobase-----	0-12	27-40	1.20-1.40	0.20-0.60	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4
	12-28	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	28-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
32C:											
Kobase-----	0-12	27-40	1.20-1.40	0.20-0.60	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4
	12-28	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	28-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
33B:											
Phillips-----	0-7	27-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	7-16	35-45	1.40-1.65	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	16-42	25-40	1.60-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	42-60	20-35	1.70-1.85	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
35B:											
Assinniboine----	0-6	5-15	1.30-1.50	0.60-2.00	0.13-0.16	Low	1.0-2.0	0.24	0.24	5	3
	6-15	18-30	1.40-1.60	0.60-2.00	0.14-0.17	Low	0.5-1.0	0.32	0.32		
	15-60	0-15	1.50-1.70	2.00-6.00	0.07-0.09	Low	0.0-0.5	0.20	0.20		
35C:											
Assinniboine----	0-6	5-15	1.30-1.50	0.60-2.00	0.13-0.16	Low	1.0-2.0	0.24	0.24	5	3
	6-15	18-30	1.40-1.60	0.60-2.00	0.14-0.17	Low	0.5-1.0	0.32	0.32		
	15-60	0-15	1.50-1.70	2.00-6.00	0.07-0.09	Low	0.0-0.5	0.20	0.20		
36C:											
Chinook-----	0-6	15-27	1.20-1.40	0.60-2.00	0.15-0.19	Low	1.0-2.0	0.32	0.32	5	5
	6-23	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	23-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-1.0	0.20	0.20		
37B:											
Evanston-----	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
37C:											
Evanston-----	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
38B:											
Ethridge-----	0-6	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	6
	6-15	35-45	1.30-1.50	0.06-0.20	0.15-0.19	High	1.0-2.0	0.32	0.32		
	15-38	30-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	38-60	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
39B:											
Ferd-----	0-5	20-27	1.25-1.45	0.20-2.00	0.15-0.19	Low	0.5-1.0	0.43	0.43	5	6
	5-9	22-35	1.30-1.50	0.20-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	9-16	35-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	16-41	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	41-60	27-40	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
42B:											
Joplin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
42C:											
Joplin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
44B:											
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
44C:											
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
45C:											
Cozberg-----	0-8	10-20	1.20-1.40	2.00-6.00	0.13-0.16	Low	2.0-4.0	0.20	0.20	2	3
	8-18	10-18	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20		
	18-60	0-10	1.45-1.65	6.00-20.00	0.04-0.06	Low	0.0-0.5	0.17	0.17		
45D:											
Cozberg-----	0-8	10-20	1.20-1.40	2.00-6.00	0.13-0.16	Low	2.0-4.0	0.20	0.20	2	3
	8-18	10-18	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20		
	18-60	0-10	1.45-1.65	6.00-20.00	0.04-0.06	Low	0.0-0.5	0.17	0.17		
47B:											
Marias-----	0-5	40-60	1.20-1.40	0.06-0.20	0.14-0.18	High	0.5-2.0	0.37	0.37	5	4
	5-27	40-60	1.25-1.45	0.00-0.06	0.12-0.16	High	0.5-1.0	0.37	0.37		
	27-60	40-60	1.30-1.50	0.00-0.06	0.12-0.16	High	0.0-0.5	0.37	0.37		
48B:											
Vanda-----	0-9	40-60	1.25-1.45	0.00-0.06	0.08-0.12	High	0.5-2.0	0.37	0.37	5	4
	9-60	35-60	1.30-1.50	0.00-0.06	0.08-0.12	High	0.0-0.5	0.37	0.37		
48C:											
Vanda-----	0-9	40-60	1.25-1.45	0.00-0.06	0.08-0.12	High	0.5-2.0	0.37	0.37	5	4
	9-60	35-60	1.30-1.50	0.00-0.06	0.08-0.12	High	0.0-0.5	0.37	0.37		
49C:											
Floweree-----	0-5	18-27	1.10-1.30	0.60-2.00	0.18-0.22	Low	1.0-2.0	0.37	0.37	5	6
	5-11	20-35	1.20-1.45	0.20-0.60	0.16-0.20	Moderate	0.5-1.0	0.32	0.32		
	11-60	20-35	1.30-1.55	0.20-0.60	0.15-0.19	Moderate	0.0-0.5	0.32	0.32		
50B:											
Telstad-----	0-5	27-32	1.20-1.40	0.60-2.00	0.15-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-19	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	19-37	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	37-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
51B:											
Turner-----	0-5	15-25	1.10-1.30	0.60-2.00	0.15-0.19	Low	2.0-4.0	0.37	0.37	3	6
	5-15	25-35	1.30-1.50	0.60-2.00	0.12-0.18	Moderate	0.5-2.0	0.32	---		
	15-21	25-35	1.35-1.50	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.37	---		
	21-60	0-5	1.35-1.50	6.00-20.00	0.01-0.06	Low	0.0-0.5	0.20	---		
53D:											
Sunburst-----	0-6	27-40	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	6-60	35-50	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		



## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
53E:											
Sunburst-----	0-6	27-40	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	6-60	35-50	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
53F:											
Sunburst-----	0-6	27-40	1.20-1.40	0.06-0.20	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	6-60	35-50	1.35-1.65	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
54B:											
Trudau-----	0-4	20-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	4L
	4-25	20-35	1.25-1.50	0.20-0.60	0.09-0.11	Moderate	0.5-1.0	0.37	0.37		
	25-60	18-27	1.30-1.55	0.20-0.60	0.08-0.10	Low	0.0-0.5	0.32	0.32		
58B:											
Lonna-----	0-5	18-27	1.10-1.30	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	5-11	18-35	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-60	10-35	1.25-1.50	0.60-2.00	0.12-0.16	Moderate	0.0-0.5	0.37	0.37		
59B:											
Hedstrom-----	0-5	15-20	1.25-1.45	2.00-6.00	0.12-0.15	Low	2.0-3.0	0.24	0.24	3	3
	5-21	20-35	1.35-1.60	0.60-2.00	0.13-0.16	Moderate	1.0-2.0	0.32	0.32		
	21-31	20-30	1.35-1.60	0.60-2.00	0.13-0.16	Moderate	0.5-1.0	0.32	0.32		
	31-60	0-5	1.45-1.65	6.00-20.00	0.04-0.05	Low	0.0-0.5	0.17	0.17		
60A:											
Havre-----	0-6	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	0.5-2.0	0.32	0.32	5	4L
	6-60	18-35	1.40-1.60	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
62A:											
Vaeda-----	0-2	35-40	1.25-1.45	0.00-0.06	0.14-0.17	High	0.5-2.0	0.37	0.37	5	4
	2-13	35-60	1.30-1.50	0.00-0.06	0.09-0.12	High	0.5-1.0	0.43	0.43		
	13-60	35-60	1.30-1.55	0.00-0.06	0.09-0.12	High	0.0-0.5	0.43	0.43		
64B:											
Nohe-----	0-4	40-50	1.30-1.50	0.00-0.06	0.13-0.16	High	0.5-2.0	0.37	0.37	5	4
	4-34	35-60	1.30-1.50	0.00-0.06	0.06-0.07	High	0.5-1.0	0.43	0.43		
	34-60	35-60	1.30-1.55	0.00-0.06	0.06-0.07	High	0.0-0.5	0.43	0.43		
67B:											
Bearpaw-----	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-20	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.60-1.80	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
68B:											
Gerber-----	0-6	40-50	1.15-1.35	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	5	4
	6-15	45-60	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-2.0	0.32	0.32		
	15-20	35-50	1.25-1.45	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	20-60	35-50	1.30-1.50	0.06-0.20	0.14-0.18	High	0.0-0.5	0.37	0.37		
69A:											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
69C:											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
71F:											
Roy-----	0-6	27-40	1.15-1.35	0.60-2.00	0.13-0.15	Low	2.0-4.0	0.17	0.32	5	6
	6-25	35-50	1.35-1.55	0.20-0.60	0.08-0.10	Moderate	0.5-1.0	0.10	0.32		
	25-60	27-40	1.45-1.65	0.20-0.60	0.04-0.06	Low	0.0-0.5	0.05	0.32		
72F:											
Zahill-----	0-5	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	5-20	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	20-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
73D:											
Yetull-----	0-4	0-10	1.35-1.55	6.00-20.00	0.05-0.08	Low	1.0-2.0	0.17	0.17	5	2
	4-60	0-10	1.45-1.65	6.00-20.00	0.05-0.07	Low	0.0-0.5	0.17	0.17		
74B:											
Shambo-----	0-6	10-27	1.10-1.30	0.60-2.00	0.18-0.22	Low	2.0-6.0	0.28	0.28	5	6
	6-15	18-35	1.20-1.50	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	15-60	10-20	1.30-1.70	2.00-6.00	0.11-0.13	Low	0.0-1.0	0.15	0.24		
75B:											
Farnuf-----	0-7	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	2.0-4.0	0.32	0.32	5	6
	7-15	25-35	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32		
	15-60	15-30	1.30-1.50	0.60-2.00	0.12-0.16	Low	0.0-0.5	0.20	0.32		
75C:											
Farnuf-----	0-7	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	2.0-4.0	0.32	0.32	5	6
	7-15	25-35	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32		
	15-60	15-30	1.30-1.50	0.60-2.00	0.12-0.16	Low	0.0-0.5	0.20	0.32		
77C:											
Tinsley-----	0-4	5-10	1.30-1.50	2.00-6.00	0.08-0.11	Low	0.7-2.0	0.10	0.20	5	3
	4-60	0-10	1.45-1.65	6.00-20.00	0.01-0.02	Low	0.0-0.5	0.05	0.17		
77E:											
Tinsley-----	0-4	5-10	1.30-1.50	2.00-6.00	0.08-0.11	Low	0.7-2.0	0.10	0.20	5	3
	4-60	0-10	1.45-1.65	6.00-20.00	0.01-0.02	Low	0.0-0.5	0.05	0.17		
79B:											
Yamacall-----	0-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.37	0.37	5	6
	6-11	18-30	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	11-60	5-15	1.35-1.60	2.00-6.00	0.11-0.15	Low	0.0-0.5	0.20	0.24		
79C:											
Yamacall-----	0-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.37	0.37	5	6
	6-11	18-30	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	11-60	5-15	1.35-1.60	2.00-6.00	0.11-0.15	Low	0.0-0.5	0.20	0.24		
79D:											
Yamacall-----	0-6	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.37	0.37	5	6
	6-11	18-30	1.25-1.45	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	11-60	5-15	1.35-1.60	2.00-6.00	0.11-0.15	Low	0.0-0.5	0.20	0.24		
80B:											
Williams-----	0-5	27-35	1.15-1.35	0.60-2.00	0.18-0.21	Moderate	2.0-5.0	0.37	0.37	5	6
	5-13	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	13-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		
80C:											
Williams-----	0-5	27-35	1.15-1.35	0.60-2.00	0.18-0.21	Moderate	2.0-5.0	0.37	0.37	5	6
	5-13	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	13-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
82B:											
Savage-----	0-5	27-35	1.20-1.40	0.60-2.00	0.16-0.20	Moderate	2.0-4.0	0.37	0.37	5	7
	5-16	35-50	1.30-1.50	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32		
	16-60	30-45	1.35-1.55	0.06-0.20	0.13-0.16	High	0.5-1.0	0.32	0.32		
85B:											
Benz-----	0-8	27-35	1.20-1.40	0.06-0.20	0.13-0.15	Moderate	1.0-2.0	0.37	0.37	5	6
	8-60	18-35	1.30-1.55	0.06-0.20	0.10-0.12	Moderate	0.0-0.5	0.37	0.37		
88C:											
Perma-----	0-10	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.17	0.32	5	5
	10-30	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	30-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	0.37		
88E:											
Perma-----	0-10	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.17	0.32	5	5
	10-30	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	30-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	0.37		
90A:											
Harlake-----	0-4	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37	5	6
	4-16	35-60	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	16-60	15-35	1.30-1.55	0.06-0.20	0.12-0.14	Low	0.5-1.0	0.37	0.37		
94C:											
Busby-----	0-5	10-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.20	0.20	3	3
	5-13	10-18	1.40-1.60	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.32	0.32		
	13-32	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-0.5	0.20	0.20		
	32-60	3-18	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.20	0.20		
94D:											
Busby-----	0-5	10-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.20	0.20	3	3
	5-13	10-18	1.40-1.60	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.32	0.32		
	13-32	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-0.5	0.20	0.20		
	32-60	3-18	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.20	0.20		
96C:											
Macar-----	0-5	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	5-12	18-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.32	0.32		
	12-60	15-30	1.25-1.55	0.60-2.00	0.13-0.15	Moderate	0.0-0.5	0.32	0.32		
96D:											
Macar-----	0-5	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	5-12	18-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.32	0.32		
	12-60	15-30	1.25-1.55	0.60-2.00	0.13-0.15	Moderate	0.0-0.5	0.32	0.32		
98B:											
Kremlin-----	0-7	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	7-16	18-30	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	1.0-2.0	0.37	0.37		
	16-40	18-30	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	40-60	10-25	1.30-1.55	0.60-2.00	0.14-0.18	Low	0.0-0.5	0.37	0.37		
101A:											
Hanly-----	0-4	5-10	1.30-1.50	6.00-20.00	0.08-0.10	Low	0.5-1.0	0.17	0.17	5	2
	4-60	5-10	1.45-1.65	6.00-20.00	0.08-0.11	Low	0.5-1.0	0.17	0.17		
Glendive-----	0-8	5-15	1.30-1.50	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20	5	3
	8-60	5-18	1.35-1.60	2.00-6.00	0.10-0.14	Low	0.5-1.0	0.20	0.20		
Havre-----	0-6	15-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	6
	6-60	18-35	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		



## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
201F:											
Cabba-----	0-6	10-20	1.25-1.45	2.00-6.00	0.12-0.15	Low	1.0-3.0	0.24	0.24	2	3
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
Rock outcrop, mudstone.											
202F:											
Cabba-----	0-6	10-20	1.25-1.45	2.00-6.00	0.12-0.15	Low	1.0-3.0	0.24	0.24	2	3
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
Dast-----	0-5	2-18	1.30-1.50	2.00-6.00	0.12-0.15	Low	1.0-2.0	0.20	0.20	3	3
	5-30	2-18	1.40-1.60	2.00-6.00	0.11-0.14	Low	0.5-1.0	0.20	0.20		
	30-60	---	---	---	---	---	---	---	---		
203E:											
Cabba-----	0-6	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	2	4L
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
Doney-----	0-5	27-35	1.25-1.45	0.60-2.00	0.16-0.18	Moderate	0.5-2.0	0.32	0.32	3	4L
	5-32	18-30	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	32-60	---	---	---	---	---	---	---	---		
211F:											
Cabbart-----	0-4	10-20	1.25-1.45	0.60-2.00	0.14-0.18	Low	1.0-2.0	0.24	0.24	2	3
	4-16	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	16-60	---	---	---	---	---	---	---	---		
Rock outcrop.											
212F:											
Cabbart-----	0-4	10-20	1.25-1.45	0.60-2.00	0.14-0.18	Low	1.0-2.0	0.24	0.24	2	3
	4-16	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	16-60	---	---	---	---	---	---	---	---		
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
213E:											
Cabbart-----	0-4	18-27	1.20-1.40	0.60-2.00	0.17-0.21	Low	1.0-2.0	0.37	0.37	2	4L
	4-16	18-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	16-60	---	---	---	---	---	---	---	---		
Delpoint-----	0-2	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	3	4L
	2-11	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	11-24	18-35	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	24-60	---	---	---	---	---	---	---	---		
221E:											
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
222E:											
Millon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Neldore-----	0-6	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	2	4
	6-18	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	18-60	---	---	---	---	---	---	---	---		
222F:											
Millon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Neldore-----	0-6	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	2	4
	6-18	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	18-60	---	---	---	---	---	---	---	---		
224E:											
Millon-----	0-5	20-27	1.20-1.40	0.60-2.00	0.18-0.20	Low	0.5-2.0	0.43	0.43	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Joplin-----	0-4	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
241C:											
Marmarth-----	0-3	20-27	1.10-1.30	0.60-2.00	0.18-0.22	Low	1.0-3.0	0.37	0.37	3	6
	3-11	18-35	1.35-1.60	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.32	0.32		
	11-32	15-30	1.35-1.60	0.60-2.00	0.14-0.18	Moderate	0.0-0.5	0.32	0.32		
	32-60	---	---	---	---	---	---	---	---		
Evanston-----	0-6	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
251C:											
Bascovy-----	0-4	35-40	1.20-1.40	0.06-0.20	0.16-0.20	Moderate	1.0-2.0	0.43	0.43	3	4
	4-13	40-60	1.30-1.50	0.00-0.06	0.14-0.18	High	0.5-1.0	0.37	0.37		
	13-30	40-60	1.30-1.50	0.00-0.06	0.13-0.16	High	0.0-0.5	0.37	0.37		
	30-60	---	---	---	---	---	---	---	---		
252D:											
Bascovy-----	0-4	40-60	1.20-1.40	0.00-0.06	0.14-0.18	High	1.0-2.0	0.37	0.37	3	4
	4-13	40-60	1.30-1.50	0.00-0.06	0.14-0.18	High	0.5-1.0	0.37	0.37		
	13-30	40-60	1.30-1.50	0.00-0.06	0.13-0.16	High	0.0-0.5	0.37	0.37		
	30-60	---	---	---	---	---	---	---	---		
Neldore-----	0-6	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	2	4
	6-18	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	18-60	---	---	---	---	---	---	---	---		
261A:											
Absher-----	0-6	40-55	1.20-1.40	0.00-0.06	0.10-0.13	High	1.0-2.0	0.37	0.37	2	4
	6-13	35-60	1.35-1.60	0.00-0.06	0.08-0.10	High	0.5-1.0	0.37	0.37		
	13-60	35-50	1.30-1.55	0.00-0.06	0.05-0.07	High	0.0-0.5	0.43	0.43		
Nobe-----	0-1	27-40	1.30-1.50	0.06-0.20	0.13-0.16	Moderate	0.5-2.0	0.43	0.43	5	6
	1-17	35-60	1.30-1.50	0.00-0.06	0.06-0.07	High	0.5-1.0	0.43	0.43		
	17-60	35-60	1.30-1.55	0.00-0.06	0.06-0.07	High	0.0-0.5	0.43	0.43		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	KF	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
<b>272B:</b>											
Attewan-----	0-4	10-15	1.30-1.50	2.00-6.00	0.13-0.16	Low	1.0-3.0	0.24	0.24	3	3
	4-12	20-35	1.40-1.60	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.32	0.32		
	12-27	15-30	1.40-1.60	0.60-2.00	0.13-0.15	Moderate	0.5-1.0	0.32	0.32		
	27-60	0-10	1.40-1.60	6.00-20.00	0.02-0.03	Low	0.0-0.5	0.05	0.24		
<b>300F:</b>											
Rubble land.											
<b>311B:</b>											
Creed-----	0-5	27-35	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	2	6
	5-12	35-55	1.30-1.55	0.06-0.20	0.10-0.14	High	1.0-2.0	0.32	0.32		
	12-60	25-35	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
Gerdum-----	0-4	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.43	0.43	2	6
	4-14	35-55	1.30-1.55	0.00-0.06	0.10-0.13	High	0.5-1.0	0.37	0.37		
	14-60	10-20	1.40-1.65	0.60-2.00	0.06-0.07	Low	0.0-0.5	0.15	0.28		
Absher-----	0-6	40-55	1.20-1.40	0.00-0.06	0.10-0.13	High	1.0-2.0	0.37	0.37	2	4
	6-13	35-60	1.35-1.60	0.00-0.06	0.08-0.10	High	0.5-1.0	0.37	0.37		
	13-60	35-50	1.30-1.55	0.00-0.06	0.05-0.07	High	0.0-0.5	0.43	0.43		
<b>321B:</b>											
Kobase-----	0-12	27-40	1.20-1.40	0.20-0.60	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4L
	12-28	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	28-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
<b>321C:</b>											
Kobase-----	0-12	27-40	1.20-1.40	0.20-0.60	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4L
	12-28	35-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	28-60	35-45	1.30-1.55	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
<b>323C:</b>											
Sagedale-----	0-5	30-40	1.20-1.40	0.06-0.20	0.16-0.20	Moderate	1.0-2.0	0.37	0.37	5	4
	5-12	32-45	1.30-1.50	0.06-0.20	0.15-0.18	Moderate	1.0-2.0	0.32	0.37		
	12-35	35-45	1.30-1.50	0.06-0.20	0.15-0.17	Moderate	0.5-1.0	0.32	0.37		
	35-60	35-45	1.30-1.55	0.06-0.20	0.14-0.16	Moderate	0.0-0.5	0.32	0.37		
<b>331B:</b>											
Phillips-----	0-7	27-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	7-16	35-45	1.40-1.65	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	16-42	25-40	1.60-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	42-60	20-35	1.70-1.85	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
Elloam-----	0-4	27-35	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	2	6
	4-15	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	15-25	30-45	1.50-1.70	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	25-60	25-40	1.70-1.90	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
<b>332B:</b>											
Phillips-----	0-7	27-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	7-16	35-45	1.40-1.65	0.06-0.20	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	16-42	25-40	1.60-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	42-60	20-35	1.70-1.85	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
364C:											
Chinook-----	0-6	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	6-23	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	23-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-1.0	0.20	0.20		
372B:											
Evanston-----	0-6	10-20	1.25-1.45	2.00-6.00	0.14-0.17	Low	1.0-3.0	0.24	0.24	5	3
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
373C:											
Evanston-----	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
Tinsley-----	0-4	5-10	1.30-1.50	2.00-6.00	0.08-0.11	Low	0.7-2.0	0.10	0.20	5	3
	4-60	0-10	1.45-1.65	6.00-20.00	0.01-0.02	Low	0.0-0.5	0.05	0.17		
374B:											
Evanston-----	0-6	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
374C:											
Evanston-----	0-6	20-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
378B:											
Evanston-----	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
Evanston, calcareous-----	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	4L
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	25-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		
379C:											
Evanston-----	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
Busby-----	0-5	10-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.20	0.20	3	3
	5-13	10-18	1.40-1.60	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.32	0.32		
	13-32	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.20	0.20		
	32-60	3-18	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.20	0.20		
384B:											
Ethridge-----	0-6	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	7
	6-15	35-45	1.30-1.50	0.06-0.20	0.15-0.19	High	1.0-2.0	0.32	0.32		
	15-38	30-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	38-60	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		



Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
386B:											
Ethridge-----	0-6	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	6
	6-15	35-45	1.30-1.50	0.06-0.20	0.15-0.19	High	1.0-2.0	0.32	0.32		
	15-38	30-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	38-60	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Evanston-----	0-6	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	6
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	15-32	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37		
	32-60	15-30	1.35-1.55	0.60-2.00	0.16-0.18	Moderate	0.0-0.5	0.37	0.37		
391B:											
Ferd-----	0-5	20-27	1.25-1.45	0.20-2.00	0.15-0.19	Low	0.5-1.0	0.43	0.43	5	6
	5-9	22-35	1.30-1.50	0.20-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	9-16	35-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	16-41	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	41-60	27-40	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
Creed-----	0-5	20-27	1.15-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.43	0.43	2	6
	5-12	35-55	1.30-1.55	0.06-0.20	0.10-0.14	High	1.0-2.0	0.32	0.32		
	12-60	25-35	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
Gerdrum-----	0-4	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.43	0.43	2	6
	4-14	35-55	1.30-1.55	0.00-0.06	0.10-0.13	High	0.5-1.0	0.37	0.37		
	14-60	10-20	1.40-1.65	0.60-2.00	0.06-0.07	Low	0.0-0.5	0.15	0.28		
391C:											
Ferd-----	0-5	20-27	1.25-1.45	0.20-2.00	0.15-0.19	Low	0.5-1.0	0.43	0.43	5	6
	5-7	22-35	1.30-1.50	0.20-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	7-16	35-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	16-41	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	41-60	27-40	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
Creed-----	0-5	20-27	1.15-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.43	0.43	2	6
	5-12	35-55	1.30-1.55	0.06-0.20	0.10-0.14	High	1.0-2.0	0.32	0.32		
	12-60	25-35	1.30-1.55	0.06-0.20	0.08-0.12	Moderate	0.0-0.5	0.37	0.37		
Gerdrum-----	0-4	27-40	1.20-1.40	0.20-0.60	0.14-0.18	Moderate	1.0-3.0	0.43	0.43	2	6
	4-14	35-55	1.30-1.55	0.00-0.06	0.10-0.13	High	0.5-1.0	0.37	0.37		
	14-60	10-20	1.40-1.65	0.60-2.00	0.06-0.07	Low	0.0-0.5	0.15	0.28		
402A:											
Gerdrum-----	0-4	27-40	1.20-1.40	0.20-0.60	0.14-0.18	M					

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
411C:											
Reeder-----	0-6	27-33	1.10-1.30	0.60-2.00	0.15-0.18	Moderate	2.0-4.0	0.28	0.28	3	6
	6-13	18-35	1.30-1.50	0.60-2.00	0.14-0.17	Moderate	1.0-2.0	0.17	0.17		
	13-32	15-30	1.30-1.50	0.60-2.00	0.14-0.17	Low	0.5-1.0	0.32	0.32		
	32-60	---	---	---	---	---	---	---	---		
Cabba-----	0-6	10-20	1.25-1.45	2.00-6.00	0.12-0.15	Low	1.0-3.0	0.24	0.24	2	3
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
421C:											
Joplin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
421D:											
Joplin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
423B:											
Joplin, calcareous----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
423C:											
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
Joplin, calcareous----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
424C:											
Joplin-----	0-4	10-27	1.20-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.24	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-32	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
Hillon-----	0-5	20-27	1.20-1.40	0.60-2.00	0.12-0.16	Low	1.0-2.0	0.24	0.43	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.32	0.32		
425C:											
Joplin, calcareous----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
<b>425C:</b>											
Telstad-----	0-5	27-32	1.20-1.40	0.60-2.00	0.15-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	5-19	25-35	1.30-1.50	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	19-37	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	37-60	20-32	1.30-1.50	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
<b>426B:</b>											
Joplin-----	0-4	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
<b>427B:</b>											
Joplin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
Joplin, calcareous-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
<b>427C:</b>											
Joplin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
Joplin, calcareous-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
<b>441C:</b>											
Kevin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-26	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	26-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Hillon-----	0-5	27-35	1.25-1.45	0.60-2.00	0.15-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-60	20-35	1.35-1.60	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.43	0.43		
<b>443B:</b>											
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Ferd-----	0-5	20-27	1.25-1.45	0.20-2.00	0.15-0.19	Low	0.5-1.0	0.43	0.43	5	6
	5-9	22-35	1.30-1.50	0.20-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	9-16	35-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	16-41	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	41-60	27-40	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
444B:											
Kevin,											
calcareous-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Ferd-----	0-5	20-27	1.25-1.45	0.20-2.00	0.15-0.19	Low	0.5-1.0	0.43	0.43	5	6
	5-9	22-35	1.30-1.50	0.20-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37		
	9-16	35-50	1.30-1.50	0.06-0.20	0.15-0.19	High	0.5-1.0	0.37	0.37		
	16-41	27-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
	41-60	27-40	1.30-1.50	0.06-0.20	0.13-0.17	Moderate	0.0-0.5	0.37	0.37		
445B:											
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Kevin,											
calcareous-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
445C:											
Kevin,											
calcareous-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
446C:											
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Elloam-----	0-4	27-35	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	2	6
	4-15	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	15-25	30-45	1.50-1.70	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	25-60	25-40	1.70-1.90	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
451A:											
Cozberg-----	0-8	10-20	1.20-1.40	2.00-6.00	0.13-0.16	Low	2.0-4.0	0.20	0.20	2	3
	8-18	10-18	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20		
	18-60	0-10	1.45-1.65	6.00-20.00	0.04-0.06	Low	0.0-0.5	0.17	0.17		
Lihen-----	0-10	10-20	1.30-1.50	6.00-20.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	10-60	0-10	1.40-1.65	6.00-20.00	0.07-0.09	Low	0.0-0.5	0.17	0.17		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
451C:											
Cozberg-----	0-8	10-20	1.20-1.40	2.00-6.00	0.13-0.16	Low	2.0-4.0	0.20	0.20	2	3
	8-18	10-18	1.30-1.55	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20		
	18-60	0-10	1.45-1.65	6.00-20.00	0.04-0.06	Low	0.0-0.5	0.17	0.17		
Lihea-----	0-10	10-20	1.30-1.50	6.00-20.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	10-60	0-10	1.40-1.65	6.00-20.00	0.07-0.09	Low	0.0-0.5	0.17	0.17		
481A:											
Bigsag-----	0-2	40-60	1.35-1.50	0.06-0.20	0.07-0.10	High	0.5-1.0	0.37	0.37	5	4
	2-16	35-60	1.35-1.50	0.00-0.06	0.07-0.10	High	0.0-0.5	0.37	0.37		
	16-60	35-60	1.35-1.50	0.00-0.06	0.07-0.10	High	0.0-0.5	0.37	0.37		
482A:											
Vanda-----	0-9	40-60	1.25-1.45	0.00-0.06	0.08-0.12	High	0.5-2.0	0.37	0.37	5	4
	9-60	35-60	1.30-1.50	0.00-0.06	0.08-0.12	High	0.0-0.5	0.37	0.37		
Marvan-----	0-7	40-60	1.25-1.45	0.06-0.20	0.11-0.15	High	0.5-1.0	0.37	0.37	5	4
	7-30	45-60	1.30-1.50	0.00-0.06	0.11-0.13	High	0.5-1.0	0.37	0.37		
	30-60	45-60	1.30-1.50	0.00-0.06	0.09-0.11	High	0.0-0.5	0.37	0.37		
503B:											
Telstad-----	0-5	27-32	1.20-1.40	0.60-2.00	0.15-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-19	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	19-37	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	37-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Joplin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
503C:											
Telstad-----	0-5	27-32	1.20-1.40	0.60-2.00	0.15-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-19	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	19-37	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	37-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Joplin-----	0-4	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
504B:											
Telstad-----	0-5	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	5-19	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	19-37	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	37-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Joplin-----	0-4	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
504C:											
Telstad-----	0-5	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	5-19	25-35	1.25-1.45	0.20-0.60	0.16-0.19	Moderate	1.0-2.0	0.37	0.37		
	19-37	20-32	1.30-1.50	0.20-0.60	0.15-0.18	Moderate	0.5-1.0	0.37	0.37		
	37-60	20-32	1.50-1.75	0.06-0.20	0.14-0.17	Moderate	0.0-0.5	0.37	0.37		
Joplin-----	0-4	10-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.43	0.43	5	6
	4-9	25-35	1.30-1.50	0.60-2.00	0.15-0.19	Moderate	1.0-2.0	0.37	0.37		
	9-26	18-22	1.30-1.55	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.28	0.37		
	26-60	18-32	1.60-1.80	0.06-0.20	0.13-0.16	Moderate	0.0-0.5	0.28	0.37		
511C:											
Turner-----	0-5	10-20	1.20-1.40	2.00-6.00	0.11-0.15	Low	2.0-4.0	0.24	0.24	3	3
	5-15	25-35	1.30-1.50	0.60-2.00	0.12-0.18	Moderate	0.5-2.0	0.32	---		
	15-21	25-35	1.35-1.50	0.60-2.00	0.12-0.18	Moderate	0.0-0.5	0.37	---		
	21-60	0-5	1.35-1.50	6.00-20.00	0.01-0.06	Low	0.0-0.5	0.20	---		
521B:											
Elloam-----	0-4	27-35	1.25-1.40	0.60-2.00	0.12-0.18	Moderate	1.0-2.0	0.43	0.43	2	6
	4-15	35-55	1.40-1.60	0.06-0.20	0.10-0.14	High	0.5-1.0	0.43	0.43		
	15-25	30-45	1.50-1.70	0.00-0.06	0.10-0.14	Moderate	0.0-0.5	0.43	0.43		
	25-60	25-40	1.70-1.90	0.00-0.06	0.08-0.12	Moderate	0.0-0.5	0.43	0.43		
Absher-----	0-6	27-40	1.20-1.40	0.06-0.20	0.12-0.16	Moderate	1.0-2.0	0.43	0.43	2	6
	6-13	35-60	1.35-1.60	0.00-0.06	0.08-0.10	High	0.5-1.0	0.37	0.37		
	13-60	35-50	1.30-1.55	0.00-0.06	0.05-0.07	High	0.0-0.5	0.43	0.43		
551E:											
Lihen-----	0-10	5-10	1.35-1.55	6.00-20.00	0.10-0.12	Low	1.0-2.0	0.17	0.17	5	2
	10-60	0-10	1.40-1.65	6.00-20.00	0.07-0.09	Low	0.0-0.5	0.17	0.17		
Blanchard-----	0-6	0-5	1.45-1.65	6.00-20.00	0.07-0.08	Low	0.5-1.0	0.17	0.17	5	2
	6-60	0-5	1.50-1.70	6.00-20.00	0.06-0.07	Low	0.0-0.5	0.17	0.17		
561B:											
Scobey-----	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-12	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	12-60	30-40	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
561C:											
Scobey-----	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-12	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	12-60	30-40	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
561D:											
Scobey-----	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-12	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	12-60	30-40	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
<b>561D:</b>											
Kevin-----	0-5	27-32	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	5-9	35-45	1.30-1.50	0.20-0.60	0.15-0.19	High	1.0-3.0	0.37	0.37		
	9-24	27-35	1.30-1.60	0.20-0.60	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	24-60	27-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
<b>563B:</b>											
Scobey, calcareous-----	0-6	27-35	1.15-1.35	0.60-2.00	0.16-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	6-12	35-45	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.32	0.32		
	12-60	30-40	1.50-1.80	0.06-0.20	0.15-0.18	Moderate	0.0-0.5	0.37	0.37		
<b>571A:</b>											
Ryell-----	0-5	15-27	1.25-1.45	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37	3	5
	5-26	10-18	1.30-1.50	0.60-2.00	0.15-0.19	Low	0.5-1.0	0.37	0.37		
	26-60	0-10	1.45-1.60	6.00-20.00	0.02-0.03	Low	0.0-0.5	0.05	0.20		
Rivra-----	0-5	5-15	1.30-1.50	2.00-6.00	0.10-0.11	Low	0.5-2.0	0.10	0.20	5	3
	5-60	0-5	1.55-1.75	>20.00	0.02-0.03	Low	0.0-0.5	0.02	0.10		
<b>572A:</b>											
Ryell-----	0-5	15-27	1.25-1.45	0.60-2.00	0.16-0.20	Low	0.5-1.0	0.37	0.37	3	5
	5-26	10-18	1.30-1.50	0.60-2.00	0.15-0.19	Low	0.5-1.0	0.37	0.37		
	26-60	0-10	1.45-1.60	6.00-20.00	0.02-0.03	Low	0.0-0.5	0.05	0.20		
Havre-----	0-6	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	6
	6-60	18-35	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
<b>581B:</b>											
Lonna-----	0-5	27-35	1.10-1.30	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	4L
	5-11	18-35	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-60	10-35	1.25-1.50	0.60-2.00	0.12-0.16	Moderate	0.0-0.5	0.37	0.37		
<b>581C:</b>											
Lonna-----	0-5	27-35	1.10-1.30	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	4L
	5-11	18-35	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-60	10-35	1.25-1.50	0.60-2.00	0.12-0.16	Moderate	0.0-0.5	0.37	0.37		
<b>582B:</b>											
Lonna-----	0-5	18-27	1.10-1.30	0.60-2.00	0.16-0.20	Low	1.0-3.0	0.37	0.37	5	4L
	5-11	18-35	1.25-1.45	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-60	10-35	1.25-1.50	0.60-2.00	0.12-0.16	Moderate	0.0-0.5	0.37	0.37		
Ethridge-----	0-6	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	1.0-3.0	0.37	0.37	5	7
	6-15	35-45	1.30-1.50	0.06-0.20	0.15-0.19	High	1.0-2.0	0.32	0.32		
	15-38	30-45	1.30-1.50	0.06-0.20	0.14-0.18	High	0.5-1.0	0.37	0.37		
	38-60	25-40	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
<b>601A:</b>											
Havre-----	0-6	15-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	4L
	6-60	18-35	1.40-1.60	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		
Glendive-----	0-8	5-15	1.30-1.50	2.00-6.00	0.13-0.16	Low	0.5-2.0	0.20	0.20	5	3
	8-60	5-18	1.35-1.60	2.00-6.00	0.10-0.14	Low	0.5-1.0	0.20	0.20		
<b>603A:</b>											
Havre-----	0-6	15-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	0.5-2.0	0.37	0.37	5	6
	6-60	18-35	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.28	0.28		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
<b>603A:</b>											
Glendive-----	0-5	5-15	1.40-1.60	2.00-6.00	0.10-0.13	Low	0.5-2.0	0.20	0.20	5	3
	5-16	5-18	1.35-1.60	2.00-6.00	0.15-0.19	Low	0.5-1.0	0.32	0.32		
	16-60	5-18	1.35-1.60	2.00-6.00	0.10-0.13	Low	0.5-1.0	0.20	0.20		
<b>651E:</b>											
Fleak-----	0-4	5-15	1.20-1.50	2.00-6.00	0.12-0.14	Low	0.5-1.0	0.20	0.20	2	3
	4-18	0-10	1.20-1.50	6.00-20.00	0.06-0.07	Low	0.0-0.5	0.17	0.17		
	18-60	---	---	---	---	---	---	---	---		
<b>Lihen-----</b>	0-10	10-20	1.30-1.50	6.00-20.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	10-60	0-10	1.40-1.65	6.00-20.00	0.07-0.09	Low	0.0-0.5	0.17	0.17		
<b>673B:</b>											
Bearpaw-----	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-20	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.60-1.80	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
<b>Daglum-----</b>	0-9	27-35	1.15-1.35	0.20-0.60	0.16-0.20	Moderate	2.0-4.0	0.32	0.32	5	6
	9-19	35-60	1.30-1.50	0.06-0.20	0.12-0.15	High	0.5-1.0	0.28	0.28		
	19-60	35-60	1.50-1.70	0.06-0.20	0.09-0.12	High	0.0-0.5	0.28	0.28		
<b>691B:</b>											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Vida, calcareous-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
<b>Williams-----</b>	0-5	27-35	1.15-1.35	0.60-2.00	0.18-0.21	Moderate	2.0-5.0	0.37	0.37	5	6
	5-13	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	13-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		
<b>691C:</b>											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Vida, calcareous-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
<b>Williams-----</b>	0-5	27-35	1.15-1.35	0.60-2.00	0.18-0.21	Moderate	2.0-5.0	0.37	0.37	5	6
	5-13	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	13-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		
<b>692D:</b>											
Vida, calcareous-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	4L
	4-9	25-35	1.30-1.50	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.30-1.50	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
<b>Williams-----</b>	0-5	27-35	1.15-1.35	0.60-2.00	0.18-0.21	Moderate	2.0-5.0	0.37	0.37	5	6
	5-13	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	13-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		



## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
692D:											
Zahill-----	0-5	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-20	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	20-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
694C:											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Williams-----	0-5	27-35	1.15-1.35	0.60-2.00	0.18-0.21	Moderate	2.0-5.0	0.37	0.37	5	6
	5-13	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	13-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		
695D:											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Williams-----	0-5	27-35	1.15-1.35	0.60-2.00	0.18-0.21	Moderate	2.0-5.0	0.37	0.37	5	6
	5-13	22-35	1.25-1.45	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	13-60	22-35	1.50-1.75	0.06-0.60	0.16-0.18	Moderate	0.5-1.0	0.37	0.37		
Zahill-----	0-5	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-20	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	20-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
696E:											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Zahill-----	0-5	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-20	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	20-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
697C:											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Bearpaw-----	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-20	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.60-1.80	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
698D:											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Bearpaw-----	0-6	27-35	1.15-1.35	0.20-0.60	0.15-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	6-13	35-50	1.30-1.50	0.20-0.60	0.15-0.18	High	0.5-1.0	0.37	0.37		
	13-20	35-45	1.30-1.55	0.20-0.60	0.15-0.18	High	0.0-0.5	0.37	0.37		
	20-60	30-45	1.60-1.80	0.06-0.20	0.12-0.15	High	0.0-0.5	0.37	0.37		
Nishon-----	0-4	27-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	0.5-1.0	0.37	0.37	5	6
	4-22	40-60	1.30-1.50	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	22-60	35-55	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.32	0.32		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
698E:											
Vida-----	0-4	27-30	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.37	0.37	5	6
	4-9	25-35	1.25-1.45	0.20-0.60	0.14-0.18	Moderate	1.0-2.0	0.37	0.37		
	9-60	25-35	1.50-1.75	0.06-0.20	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
Zahill-----	0-5	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-20	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	20-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Nishon-----	0-4	27-35	1.25-1.45	0.60-2.00	0.14-0.17	Moderate	0.5-1.0	0.37	0.37	5	6
	4-22	40-60	1.30-1.50	0.06-0.20	0.14-0.17	High	0.5-1.0	0.32	0.32		
	22-60	35-55	1.30-1.50	0.06-0.20	0.14-0.17	High	0.0-0.5	0.32	0.32		
721E:											
Zahill-----	0-5	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-20	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	20-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Zahl-----	0-4	18-27	1.10-1.40	0.60-2.00	0.17-0.22	Moderate	1.0-3.0	0.37	0.37	5	6
	4-8	20-30	1.20-1.60	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	8-60	20-30	1.20-1.70	0.06-0.20	0.12-0.15	Moderate	0.0-0.5	0.37	0.37		
721F:											
Zahill-----	0-5	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-20	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	20-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Zahl-----	0-4	18-27	1.10-1.40	0.60-2.00	0.17-0.22	Moderate	1.0-3.0	0.37	0.37	5	6
	4-8	20-30	1.20-1.60	0.60-2.00	0.15-0.19	Moderate	0.5-1.0	0.37	0.37		
	8-60	20-30	1.20-1.70	0.06-0.20	0.12-0.15	Moderate	0.0-0.5	0.37	0.37		
722F:											
Zahill-----	0-5	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	0.5-2.0	0.37	0.37	5	4L
	5-20	25-35	1.30-1.60	0.20-0.60	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	20-60	20-35	1.60-1.80	0.06-0.20	0.14-0.18	Moderate	0.0-0.5	0.37	0.37		
Dast-----	0-5	2-18	1.30-1.50	2.00-6.00	0.12-0.15	Low	1.0-2.0	0.20	0.20	3	3
	5-30	2-18	1.40-1.60	2.00-6.00	0.11-0.14	Low	0.5-1.0	0.20	0.20		
	30-60	---	---	---	---	---	---	---	---		
Cabba-----	0-6	10-20	1.25-1.45	2.00-6.00	0.12-0.15	Low	1.0-3.0	0.24	0.24	2	3
	6-15	20-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	0.5-1.0	0.37	0.37		
	15-60	---	---	---	---	---	---	---	---		
743A:											
Shambo-----	0-6	10-27	1.10-1.30	0.60-2.00	0.18-0.22	Low	2.0-6.0	0.28	0.28	5	6
	6-15	18-35	1.20-1.50	0.60-2.00	0.17-0.19	Moderate	1.0-2.0	0.37	0.37		
	15-60	10-20	1.30-1.70	2.00-6.00	0.11-0.13	Low	0.0-1.0	0.15	0.24		
Fairway-----	0-10	15-27	1.20-1.40	0.60-2.00	0.18-0.22	Low	2.0-5.0	0.32	0.32	4	6
	10-30	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.37	0.37		
	30-41	20-30	1.20-1.40	0.60-2.00	0.15-0.19	Low	0.5-1.0	0.37	0.37		
	41-60	0-10	1.20-1.50	6.00-20.00	0.03-0.04	Low	0.0-0.5	0.10	0.20		
761B:											
Fairway-----	0-10	15-27	1.20-1.40	0.60-2.00	0.18-0.22	Low	2.0-5.0	0.37	0.37	4	6
	10-30	18-27	1.20-1.40	0.60-2.00	0.16-0.20	Low	1.0-2.0	0.37	0.37		
	30-41	20-30	1.20-1.40	0.60-2.00	0.15-0.19	Low	0.5-1.0	0.37	0.37		
	41-60	0-10	1.20-1.50	6.00-20.00	0.03-0.04	Low	0.0-0.5	0.10	0.20		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
<b>761B:</b>											
Big sandy-----	0-5	15-27	1.07-1.36	0.60-2.00	0.14-0.18	Low	1.0-2.0	0.43	0.43	5	4L
	5-10	18-35	1.30-1.50	0.20-0.60	0.13-0.17	Low	0.5-1.0	0.37	0.37		
	10-32	18-35	1.30-1.50	0.20-0.60	0.12-0.16	Low	0.0-0.5	0.05	0.05		
	32-60	15-35	1.30-1.50	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
<b>793B:</b>											
Yamacall-----	0-6	16-27	1.20-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.37	0.37	5	4L
	6-11	18-30	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-60	10-30	1.25-1.45	2.00-6.00	0.14-0.18	Low	0.0-0.5	0.32	0.32		
<b>793C:</b>											
Yamacall-----	0-6	16-27	1.20-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.37	0.37	5	4L
	6-11	18-30	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-60	10-30	1.25-1.45	2.00-6.00	0.14-0.18	Low	0.0-0.5	0.32	0.32		
<b>793D:</b>											
Yamacall-----	0-6	16-27	1.20-1.40	0.60-2.00	0.14-0.18	Low	1.0-3.0	0.37	0.37	5	4L
	6-11	18-30	1.30-1.50	0.60-2.00	0.16-0.20	Moderate	0.5-1.0	0.37	0.37		
	11-60	10-30	1.25-1.45	2.00-6.00	0.14-0.18	Low	0.0-0.5	0.32	0.32		
<b>831B:</b>											
Enbar-----	0-18	18-27	1.15-1.35	0.60-2.00	0.16-0.20	Low	3.0-5.0	0.37	0.37	4	6
	18-30	18-30	1.30-1.50	0.60-2.00	0.14-0.16	Low	1.0-3.0	0.37	0.37		
	30-50	10-27	1.35-1.55	0.60-2.00	0.14-0.18	Low	0.5-1.0	0.37	0.37		
	50-60	5-18	1.50-1.70	2.00-6.00	0.04-0.05	Low	0.0-0.5	0.05	0.20		
Big sandy-----	0-5	15-27	1.07-1.36	0.60-2.00	0.14-0.18	Low	1.0-2.0	0.43	0.43	5	4L
	5-10	18-35	1.30-1.50	0.20-0.60	0.13-0.17	Low	0.5-1.0	0.37	0.37		
	10-32	18-35	1.30-1.50	0.20-0.60	0.12-0.16	Low	0.0-0.5	0.05	0.05		
	32-60	15-35	1.30-1.50	0.06-0.20	0.10-0.14	Moderate	0.0-0.5	0.37	0.37		
Korchea-----	0-14	18-27	1.20-1.50	0.60-2.00	0.17-0.21	Low	1.0-3.0	0.37	0.37	5	6
	14-60	18-27	1.30-1.60	0.60-2.00	0.15-0.18	Low	0.5-1.0	0.37	0.37		
<b>861F:</b>											
Stemple-----	0-8	10-20	1.20-1.40	0.60-2.00	0.07-0.09	Low	0.5-2.0	0.10	0.37	5	5
	8-32	10-20	1.20-1.40	0.60-2.00	0.05-0.07	Low	0.5-1.0	0.10	0.37		
	32-37	15-27	1.30-1.50	0.60-2.00	0.05-0.07	Low	0.0-0.5	0.10	0.37		
	37-60	27-35	1.30-1.50	0.60-2.00	0.05-0.06	Moderate	0.0-0.5	0.10	0.32		
Rubble land.											
<b>862F:</b>											
Stemple-----	0-8	10-20	1.20-1.40	0.60-2.00	0.07-0.09	Low	0.5-2.0	0.10	0.37	5	5
	8-32	10-20	1.20-1.40	0.60-2.00	0.05-0.07	Low	0.5-1.0	0.10	0.37		
	32-37	15-27	1.30-1.50	0.60-2.00	0.05-0.07	Low	0.0-0.5	0.10	0.37		
	37-60	27-35	1.30-1.50	0.60-2.00	0.05-0.06	Moderate	0.0-0.5	0.10	0.32		
Rubble land.											
<b>871B:</b>											
Nesda-----	0-12	10-20	1.20-1.40	0.60-2.00	0.12-0.16	Low	2.0-4.0	0.20	0.37	2	5
	12-60	0-10	1.55-1.70	6.00-20.00	0.03-0.04	Low	0.5-1.0	0.02	0.10		
Nesda, cool-----	0-10	10-20	1.15-1.35	2.00-6.00	0.08-0.12	Low	2.0-4.0	0.10	0.32	2	5
	10-60	0-10	1.50-1.70	6.00-20.00	0.03-0.05	Low	0.5-1.0	0.02	0.10		

## Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group
								K	Kf	T	
	In	Pct	g/cc	In/hr	In/in		Pct				
<b>881E:</b>											
Perma-----	0-10	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.17	0.32	5	5
	10-30	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	30-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	0.37		
Whitlash-----	0-9	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	9-19	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	19-60	---	---	---	---	---	---	---	---		
<b>881F:</b>											
Perma-----	0-10	7-20	1.30-1.50	0.60-2.00	0.12-0.14	Low	2.0-4.0	0.17	0.32	5	5
	10-30	7-20	1.40-1.60	0.60-2.00	0.08-0.09	Low	1.0-2.0	0.10	0.37		
	30-60	0-15	1.50-1.70	2.00-6.00	0.03-0.04	Low	0.0-0.5	0.05	0.37		
Whitlash-----	0-9	10-27	1.10-1.30	0.60-2.00	0.10-0.16	Low	2.0-4.0	0.20	0.37	1	5
	9-19	10-27	1.10-1.35	0.60-2.00	0.05-0.10	Low	2.0-4.0	0.10	0.37		
	19-60	---	---	---	---	---	---	---	---		
<b>942C:</b>											
Busby-----	0-5	10-18	1.30-1.50	2.00-6.00	0.12-0.16	Low	1.0-2.0	0.20	0.20	3	3
	5-13	10-18	1.40-1.60	2.00-6.00	0.12-0.16	Low	0.5-1.0	0.32	0.32		
	13-32	10-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.5-1.0	0.20	0.20		
	32-60	3-18	1.50-1.70	6.00-20.00	0.08-0.10	Low	0.0-0.5	0.20	0.20		
Chinook-----	0-6	5-18	1.25-1.45	2.00-6.00	0.13-0.16	Low	1.0-2.0	0.20	0.20	5	3
	6-23	5-18	1.40-1.60	2.00-6.00	0.12-0.15	Low	0.0-1.0	0.20	0.20		
	23-60	5-15	1.40-1.65	2.00-6.00	0.11-0.12	Low	0.0-1.0	0.20	0.20		
<b>961B:</b>											
Macar-----	0-5	27-35	1.20-1.40	0.60-2.00	0.14-0.18	Moderate	1.0-3.0	0.32	0.32	5	4L
	5-12	18-35	1.30-1.50	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.32	0.32		
	12-60	15-30	1.30-1.60	0.60-2.00	0.13-0.16	Moderate	0.0-0.5	0.32	0.32		
<b>971C:</b>											
Neldore-----	0-6	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	2	4
	6-18	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	18-60	---	---	---	---	---	---	---	---		
Bascovy-----	0-4	40-60	1.20-1.40	0.00-0.06	0.14-0.18	High	1.0-2.0	0.37	0.37	3	4
	4-13	40-60	1.30-1.50	0.00-0.06	0.14-0.18	High	0.5-1.0	0.37	0.37		
	13-30	40-60	1.30-1.50	0.00-0.06	0.13-0.16	High	0.0-0.5	0.37	0.37		
	30-60	---	---	---	---	---	---	---	---		
<b>971F:</b>											
Neldore-----	0-6	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	2	4
	6-18	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	18-60	---	---	---	---	---	---	---	---		
Bascovy-----	0-4	40-60	1.20-1.40	0.00-0.06	0.14-0.18	High	1.0-2.0	0.37	0.37	3	4
	4-13	40-60	1.30-1.50	0.00-0.06	0.14-0.18	High	0.5-1.0	0.37	0.37		
	13-30	40-60	1.30-1.50	0.00-0.06	0.13-0.16	High	0.0-0.5	0.37	0.37		
	30-60	---	---	---	---	---	---	---	---		
<b>972F:</b>											
Neldore-----	0-6	40-50	1.20-1.40	0.06-0.20	0.14-0.18	High	1.0-3.0	0.32	0.32	2	4
	6-18	40-60	1.30-1.50	0.06-0.20	0.12-0.16	High	0.5-1.0	0.32	0.32		
	18-60	---	---	---	---	---	---	---	---		
Lambeth-----	0-4	20-27	1.20-1.40	0.20-0.60	0.18-0.22	Low	1.0-2.0	0.37	0.37	5	4L
	4-60	20-35	1.25-1.50	0.20-0.60	0.17-0.21	Moderate	0.0-1.0	0.37	0.37		

[illegible]

## Chemical Properties of the Soils

(Absence of an entry indicates that the data were not available or were not estimated.)

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
2A: Riverwash.								
4B: Brockway-----	0-6	18-27	20.0-25.0	7.4-8.4	5-15	---	---	---
	6-15	18-27	15.0-20.0	7.4-8.4	5-15	---	---	---
	15-38	18-35	15.0-25.0	7.4-9.0	15-40	---	---	---
	38-60	18-35	15.0-20.0	7.4-9.0	15-25	0-3	0-4	---
4C: Brockway-----	0-6	18-27	20.0-25.0	7.4-8.4	5-15	---	---	---
	6-15	18-27	15.0-20.0	7.4-8.4	5-15	---	---	---
	15-38	18-35	15.0-25.0	7.4-9.0	15-40	---	---	---
	38-60	18-35	15.0-20.0	7.4-9.0	15-25	0-3	0-4	---
12C: Tally-----	0-4	5-15	10.0-15.0	6.1-7.8	---	---	---	---
	4-14	5-18	5.0-10.0	6.6-8.4	---	---	---	---
	14-42	5-18	5.0-10.0	7.4-8.4	---	---	0-2	---
	42-60	5-10	5.0-10.0	7.4-8.4	5-15	---	0-2	---
12D: Tally-----	0-4	5-15	10.0-15.0	6.1-7.8	---	---	---	---
	4-14	5-18	5.0-10.0	6.6-8.4	---	---	---	---
	14-42	5-18	5.0-10.0	7.4-8.4	---	---	0-2	---
	42-60	5-10	5.0-10.0	7.4-8.4	5-15	---	0-2	---
13B: Tanna-----	0-6	27-35	20.0-25.0	6.6-7.8	---	---	---	---
	6-15	35-45	25.0-30.0	6.6-8.4	---	---	0-4	---
	15-28	15-30	15.0-25.0	7.4-9.0	5-15	---	0-4	---
	28-60	---	---	---	---	---	---	---
13C: Tanna-----	0-6	27-35	20.0-25.0	6.6-7.8	---	---	---	---
	6-15	35-45	25.0-30.0	6.6-8.4	---	---	0-4	---
	15-28	15-30	15.0-25.0	7.4-9.0	5-15	---	0-4	---
	28-60	---	---	---	---	---	---	---
14A: McKenzie-----	0-4	40-60	25.0-30.0	6.6-9.0	1-10	---	2-8	---
	4-24	40-60	20.0-25.0	6.6-9.0	---	---	2-8	---
	24-60	40-60	20.0-25.0	7.9-9.0	---	---	2-8	---
15F: Lambeth-----	0-4	20-27	15.0-20.0	6.6-8.4	5-10	---	---	---
	4-60	20-35	15.0-20.0	7.9-9.0	10-15	1-5	0-4	1-5
16B: Degrand-----	0-5	10-27	10.0-15.0	6.6-7.8	---	---	---	---
	5-24	20-35	15.0-20.0	6.6-8.4	---	---	---	---
	24-60	0-5	1.0-5.0	7.9-8.4	8-15	---	0-2	---
19B: Kenilworth-----	0-6	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	6-11	15-30	15.0-25.0	6.6-7.8	---	---	---	---
	11-15	20-35	20.0-30.0	6.6-7.8	5-10	---	---	---
	15-24	27-35	20.0-30.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	20.0-30.0	7.9-9.0	5-15	1-3	0-4	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pot	Pct	mmhos/cm	
20C:								
Cabba-----	0-6	10-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---
20D:								
Cabba-----	0-6	10-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---
22E:								
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
22F:								
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
23A:								
Acel-----	0-5	27-35	15.0-20.0	6.6-7.8	---	---	---	---
	5-22	40-55	25.0-30.0	6.6-7.8	---	---	---	---
	22-60	35-45	15.0-20.0	7.9-9.0	5-15	---	0-2	---
26B:								
Absher-----	0-6	40-55	25.0-30.0	6.6-8.4	---	---	4-8	1-5
	6-13	35-60	25.0-30.0	6.6-8.4	---	---	8-16	18-70
	13-60	35-50	20.0-25.0	7.8-9.6	4-15	---	16	18-70
27B:								
Attewan-----	0-4	10-20	5.0-10.0	6.1-7.3	---	---	---	---
	4-12	20-35	15.0-20.0	6.6-7.8	---	---	---	---
	12-27	15-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	27-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
28A:								
Nishon-----	0-4	27-35	15.0-20.0	6.1-7.8	---	---	---	---
	4-22	40-60	30.0-35.0	6.6-9.0	---	---	0-2	---
	22-60	35-55	30.0-35.0	7.4-9.0	1-15	---	2-4	---
29B:								
Nunemaker-----	0-4	35-40	25.0-30.0	7.4-8.4	5-10	---	---	---
	4-12	45-55	25.0-30.0	7.4-8.4	5-15	---	---	---
	12-60	35-50	20.0-25.0	7.9-9.0	5-10	---	0-4	---
29C:								
Nunemaker-----	0-4	35-40	25.0-30.0	7.4-8.4	5-10	---	---	---
	4-12	45-55	25.0-30.0	7.4-8.4	5-15	---	---	---
	12-60	35-50	20.0-25.0	7.9-9.0	5-10	---	0-4	---
30B:								
Marvan-----	0-7	40-60	30.0-40.0	7.4-8.4	5-10	---	0-4	---
	7-30	45-60	30.0-40.0	7.9-9.0	5-10	---	2-8	8-18
	30-60	45-60	25.0-35.0	7.9-9.0	5-10	---	8-16	13-38
30C:								
Marvan-----	0-7	40-60	30.0-40.0	7.4-8.4	5-10	---	0-4	---
	7-30	45-60	30.0-40.0	7.9-9.0	5-10	---	2-8	8-18
	30-60	45-60	25.0-35.0	7.9-9.0	5-10	---	8-16	13-38

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
<b>32B:</b>								
Kobase-----	0-12	27-40	25.0-30.0	6.6-8.4	0-5	---	0-2	---
	12-28	35-45	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	28-60	35-45	20.0-25.0	7.9-9.0	5-15	---	0-4	---
<b>32C:</b>								
Kobase-----	0-12	27-40	25.0-30.0	6.6-8.4	0-5	---	0-2	---
	12-28	35-45	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	28-60	35-45	20.0-25.0	7.9-9.0	5-15	---	0-4	---
<b>33B:</b>								
Phillips-----	0-7	27-35	15.0-20.0	6.1-7.3	---	---	0-2	---
	7-16	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	16-42	25-40	15.0-20.0	7.4-8.4	10-15	---	0-4	---
	42-60	20-35	15.0-20.0	7.4-8.4	5-10	---	4-8	---
<b>35B:</b>								
Assinniboine----	0-6	5-15	10.0-15.0	6.1-7.8	---	---	---	---
	6-15	18-30	15.0-20.0	6.6-7.8	---	---	0-2	---
	15-60	0-15	5.0-10.0	7.4-8.4	5-10	---	0-2	---
<b>35C:</b>								
Assinniboine----	0-6	5-15	10.0-15.0	6.1-7.8	---	---	---	---
	6-15	18-30	15.0-20.0	6.6-7.8	---	---	0-2	---
	15-60	0-15	5.0-10.0	7.4-8.4	5-10	---	0-2	---
<b>36C:</b>								
Chinook-----	0-6	15-27	15.0-20.0	6.6-8.4	---	---	0-2	---
	6-23	5-18	5.0-10.0	6.6-9.0	---	---	0-2	---
	23-60	5-15	5.0-10.0	7.4-9.0	3-15	---	0-2	---
<b>37B:</b>								
Evanston-----	0-6	27-32	20.0-25.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
<b>37C:</b>								
Evanston-----	0-6	27-32	20.0-25.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
<b>38B:</b>								
Ethridge-----	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-15	35-45	25.0-30.0	6.6-8.4	---	---	---	---
	15-38	30-45	20.0-25.0	7.4-8.4	5-15	---	---	1-5
	38-60	25-40	20.0-25.0	7.4-8.4	5-15	1-3	2-4	1-5
<b>39B:</b>								
Ferd-----	0-5	20-27	10.0-20.0	6.6-7.3	---	---	---	---
	5-9	22-35	10.0-25.0	6.6-7.8	---	---	---	---
	9-16	35-50	15.0-30.0	6.6-8.4	---	---	0-2	---
	16-41	27-40	10.0-25.0	7.9-9.0	5-15	---	2-8	0-13
	41-60	27-40	10.0-25.0	8.4-9.6	5-15	1-3	4-8	8-13
<b>42B:</b>								
Joplin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---



## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
42C:								
Joplin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
44B:								
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
44C:								
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
45C:								
Cozberg-----	0-8	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	8-18	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	18-60	0-10	1.0-5.0	7.4-8.4	15-35	---	0-2	---
45D:								
Cozberg-----	0-8	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	8-18	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	18-60	0-10	1.0-5.0	7.4-8.4	15-35	---	0-2	---
47B:								
Marias-----	0-5	40-60	30.0-35.0	7.4-8.4	5-10	---	2-4	---
	5-27	40-60	25.0-30.0	7.9-9.0	5-10	---	2-4	---
	27-60	40-60	25.0-30.0	7.9-9.0	5-10	---	2-8	---
48B:								
Vanda-----	0-9	40-60	25.0-35.0	7.8-9.6	2-10	---	2-8	20-30
	9-60	35-60	20.0-30.0	7.8-9.6	1-5	---	8-16	13-30
48C:								
Vanda-----	0-9	40-60	25.0-35.0	7.8-9.6	2-10	---	2-8	20-30
	9-60	35-60	20.0-30.0	7.8-9.6	1-5	---	8-16	13-30
49C:								
Flowerree-----	0-5	18-27	15.0-20.0	6.6-8.4	---	---	0-2	---
	5-11	20-35	10.0-15.0	7.4-8.4	1-5	---	0-2	---
	11-60	20-35	10.0-15.0	7.9-9.0	5-15	0-2	2-4	1-5
50B:								
Telstad-----	0-5	27-32	20.0-25.0	6.6-7.8	0-5	---	---	---
	5-19	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	19-37	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	37-60	20-32	15.0-20.0	7.9-8.4	3-12	---	2-4	---
51B:								
Turner-----	0-5	15-25	10.0-20.0	6.1-7.8	---	---	---	---
	5-15	25-35	10.0-25.0	6.6-8.4	---	---	---	---
	15-21	25-35	10.0-20.0	7.4-8.4	8-15	---	---	---
	21-60	0-5	1.0-5.0	7.4-8.4	2-12	---	0-2	---
53D:								
Sunburst-----	0-6	27-40	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	6-60	35-50	20.0-25.0	7.9-9.0	5-15	---	2-8	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
53E:								
Sunburst-----	0-6	27-40	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	6-60	35-50	20.0-25.0	7.9-9.0	5-15	---	2-8	---
53F:								
Sunburst-----	0-6	27-40	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	6-60	35-50	20.0-25.0	7.9-9.0	5-15	---	2-8	---
54B:								
Trudau-----	0-4	20-27	10.0-15.0	8.5-9.0	5-10	---	0-2	0-5
	4-25	20-35	15.0-20.0	8.5-9.0	5-10	---	8-16	0-5
	25-60	18-27	10.0-15.0	8.5-9.0	5-15	---	8-16	2-13
58B:								
Lonna-----	0-5	18-27	15.0-20.0	6.6-7.8	0-5	---	0-2	---
	5-11	18-35	10.0-15.0	7.4-8.4	1-5	---	0-2	---
	11-60	10-35	5.0-15.0	7.9-8.4	5-15	---	2-8	0-13
59B:								
Hedstrom-----	0-5	15-20	10.0-15.0	6.6-7.3	---	---	---	---
	5-21	20-35	15.0-20.0	6.6-7.8	---	---	---	---
	21-31	20-30	10.0-15.0	7.9-9.0	5-15	---	0-4	---
	31-60	0-5	1.0-5.0	7.4-8.4	5-10	---	0-4	---
60A:								
Havre-----	0-6	27-40	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	6-60	18-35	15.0-25.0	7.4-9.0	5-10	---	0-4	---
62A:								
Vaeda-----	0-2	35-40	20.0-25.0	5.6-7.8	---	---	2-4	0-5
	2-13	35-60	25.0-30.0	5.1-7.8	---	---	4-16	10-20
	13-60	35-60	25.0-30.0	6.1-8.4	---	---	4-16	10-20
64B:								
Nobe-----	0-4	40-50	25.0-30.0	6.6-8.4	---	---	4-8	0-13
	4-34	35-60	25.0-30.0	7.8-9.6	5-10	---	16	0-30
	34-60	35-60	25.0-30.0	7.8-9.6	5-10	---	16	13-40
67B:								
Bearpaw-----	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-13	35-50	25.0-30.0	6.6-8.4	---	---	---	---
	13-20	35-45	20.0-25.0	7.4-8.4	5-10	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-9.0	5-15	0-2	2-8	5-8
68B:								
Gerber-----	0-6	40-50	25.0-30.0	6.6-7.8	1-5	---	---	---
	6-15	45-60	25.0-30.0	7.4-8.4	---	---	0-2	---
	15-20	35-50	20.0-25.0	7.4-8.4	5-15	---	2-4	---
	20-60	35-50	20.0-25.0	7.4-9.0	5-10	---	2-4	---
69A:								
Vida-----	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
69C:								
Vida-----	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
71F:								
Roy-----	0-6	27-40	11.0-24.0	6.1-7.8	---	---	---	---
	6-25	35-50	14.0-30.0	6.6-7.8	---	---	---	---
	25-60	27-40	11.0-24.0	7.4-8.4	1-5	---	0-4	---
72F:								
Zahill-----	0-5	20-27	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-20	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	20-60	20-35	15.0-20.0	7.4-9.0	2-12	---	0-2	---
73D:								
Yetull-----	0-4	0-10	5.0-10.0	6.6-7.8	0-5	---	---	---
	4-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-4	---
74B:								
Shambo-----	0-6	10-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-15	18-35	10.0-15.0	6.6-8.4	---	---	---	1-5
	15-60	10-20	5.0-10.0	7.4-8.4	5-10	---	---	1-5
75B:								
Farnuf-----	0-7	27-32	15.0-20.0	6.1-7.8	---	---	---	---
	7-15	25-35	15.0-20.0	6.1-7.8	---	---	---	---
	15-60	15-30	10.0-15.0	7.4-8.4	5-10	---	2-8	5-10
75C:								
Farnuf-----	0-7	27-32	15.0-20.0	6.1-7.8	---	---	---	---
	7-15	25-35	15.0-20.0	6.1-7.8	---	---	---	---
	15-60	15-30	10.0-15.0	7.4-8.4	5-10	---	2-8	5-10
77C:								
Tinsley-----	0-4	5-10	5.0-10.0	6.6-7.8	1-10	---	---	---
	4-60	0-10	1.0-5.0	6.6-8.4	2-10	---	0-2	---
77E:								
Tinsley-----	0-4	5-10	5.0-10.0	6.6-7.8	1-10	---	---	---
	4-60	0-10	1.0-5.0	6.6-8.4	2-10	---	0-2	---
79B:								
Yamacall-----	0-6	18-27	15.0-20.0	6.6-8.4	0-5	---	---	---
	6-11	18-30	10.0-15.0	6.6-8.4	0-5	---	---	---
	11-60	5-15	5.0-10.0	7.9-8.4	5-10	---	0-4	1-5
79C:								
Yamacall-----	0-6	18-27	15.0-20.0	6.6-8.4	0-5	---	---	---
	6-11	18-30	10.0-15.0	6.6-8.4	0-5	---	---	---
	11-60	5-15	5.0-10.0	7.9-8.4	5-10	---	0-4	1-5
79D:								
Yamacall-----	0-6	18-27	15.0-20.0	6.6-8.4	0-5	---	---	---
	6-11	18-30	10.0-15.0	6.6-8.4	0-5	---	---	---
	11-60	5-15	5.0-10.0	7.9-8.4	5-10	---	0-4	1-5
80B:								
Williams-----	0-5	27-35	20.0-25.0	6.6-7.3	0-5	---	---	---
	5-13	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---
80C:								
Williams-----	0-5	27-35	20.0-25.0	6.6-7.3	0-5	---	---	---
	5-13	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
82B:								
Savage-----	0-5	27-35	25.0-30.0	6.1-7.8	---	---	---	---
	5-16	35-50	30.0-35.0	6.1-8.4	---	---	0-4	---
	16-60	30-45	25.0-30.0	7.4-8.4	5-15	---	0-4	---
85B:								
Benz-----	0-8	27-35	10.0-25.0	7.3-9.6	0-5	---	4-8	4-13
	8-60	18-35	10.0-20.0	8.4-9.6	5-15	---	8-16	13-30
88C:								
Perma-----	0-10	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	10-30	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	30-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
88E:								
Perma-----	0-10	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	10-30	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	30-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
90A:								
Marlake-----	0-4	27-40	20.0-25.0	6.6-8.4	1-5	---	0-4	---
	4-16	35-60	25.0-35.0	7.4-8.4	5-10	---	0-4	---
	16-60	15-35	15.0-20.0	7.9-9.0	5-10	---	0-8	---
94C:								
Busby-----	0-5	10-18	10.0-15.0	7.4-8.4	0-5	---	---	---
	5-13	10-18	10.0-15.0	7.4-8.4	---	---	---	---
	13-32	10-18	5.0-15.0	7.9-8.4	5-15	---	0-2	---
	32-60	3-18	5.0-10.0	7.9-8.4	5-15	---	0-4	---
94D:								
Busby-----	0-5	10-18	10.0-15.0	7.4-8.4	0-5	---	---	---
	5-13	10-18	10.0-15.0	7.4-8.4	---	---	---	---
	13-32	10-18	5.0-15.0	7.9-8.4	5-15	---	0-2	---
	32-60	3-18	5.0-10.0	7.9-8.4	5-15	---	0-4	---
96C:								
Macar-----	0-5	18-27	15.0-20.0	6.6-8.4	0-5	---	---	---
	5-12	18-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	12-60	15-30	10.0-15.0	7.4-9.0	5-12	---	0-2	---
96D:								
Macar-----	0-5	18-27	15.0-20.0	6.6-8.4	0-5	---	---	---
	5-12	18-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	12-60	15-30	10.0-15.0	7.4-9.0	5-12	---	0-2	---
98B:								
Kremlin-----	0-7	18-27	15.0-20.0	6.1-7.8	---	---	---	---
	7-16	18-30	10.0-15.0	6.6-7.8	---	---	---	---
	16-40	18-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	40-60	10-25	5.0-10.0	7.4-8.4	3-12	---	0-4	---
101A:								
Hanly-----	0-4	5-10	5.0-10.0	6.6-8.4	1-5	---	---	---
	4-60	5-10	5.0-10.0	6.6-8.4	5-10	---	---	---
Glendive-----	0-8	5-15	10.0-15.0	6.6-9.0	1-5	---	0-4	---
	8-60	5-18	10.0-15.0	7.4-9.0	5-10	---	2-8	---
Havre-----	0-6	15-27	15.0-20.0	6.1-8.4	1-5	---	0-2	---
	6-60	18-35	15.0-25.0	7.4-9.0	1-5	---	0-4	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
110A:								
Korchea-----	0-6	18-27	15.0-20.0	6.6-8.4	1-5	---	---	---
	6-60	18-27	15.0-20.0	7.4-9.0	5-10	---	0-4	---
Kiwanis-----	0-5	5-15	10.0-15.0	6.6-7.8	---	---	---	---
	5-36	5-10	5.0-10.0	7.4-8.4	5-10	---	0-2	---
	36-60	0-5	1.0-5.0	7.4-8.4	5-10	---	0-2	---
141A:								
McKenzie-----	0-4	40-60	25.0-30.0	8.5-9.0	1-10	---	8-16	0-10
	4-60	40-60	20.0-25.0	8.5-9.0	---	---	8-16	5-13
143A:								
Meadowcreek----	0-9	18-25	20.0-25.0	7.4-8.4	0-5	---	---	---
	9-16	18-25	15.0-20.0	7.4-8.4	1-5	---	---	---
	16-21	18-25	15.0-20.0	6.6-7.8	1-5	---	---	---
	21-60	0-10	1.0-5.0	6.1-7.3	5-10	---	---	---
144A:								
Bigsandy-----	0-5	27-35	25.0-30.0	7.4-9.0	5-10	---	0-4	0-4
	5-10	18-35	20.0-25.0	7.9-9.0	15-30	---	0-4	0-4
	10-32	18-35	15.0-20.0	8.5-9.0	15-30	---	4-8	5-13
	32-60	15-35	15.0-20.0	8.5-9.0	5-15	1-3	8-16	5-13
162B:								
Degrand-----	0-5	10-20	5.0-10.0	6.6-7.8	---	---	---	---
	5-24	20-35	15.0-20.0	6.6-8.4	---	---	---	---
	24-60	0-5	1.0-5.0	7.9-8.4	8-15	---	0-2	---
171F:								
Delpoint-----	0-2	27-35	20.0-25.0	7.4-8.4	5-10	---	0-4	---
	2-11	18-35	15.0-20.0	7.9-8.4	5-10	---	0-4	---
	11-24	18-35	10.0-15.0	7.9-8.4	5-15	---	0-4	---
	24-60	---	---	---	---	---	---	---
Cabbart-----	0-4	27-32	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	4-16	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	16-60	---	---	---	---	---	---	---
181D:								
Doney-----	0-5	27-35	15.0-20.0	6.6-8.4	5-10	---	0-2	---
	5-32	18-30	10.0-15.0	7.9-9.0	5-15	---	2-4	---
	32-60	---	---	---	---	---	---	---
Cabba-----	0-6	10-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---
91B:								
Kenilworth-----	0-6	5-18	15.0-20.0	6.6-7.8	---	---	---	---
	6-11	15-30	15.0-25.0	6.6-7.8	---	---	---	---
	11-15	20-35	20.0-30.0	6.6-7.8	5-10	---	---	---
	15-24	27-35	20.0-30.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	20.0-30.0	7.9-9.0	5-15	1-3	0-4	---
200F:								
Badland.								

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
201F:								
Cabba-----	0-6	10-20	10.0-15.0	7.4-9.0	0-10	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---
Rock outcrop, mudstone.								
202F:								
Cabba-----	0-6	10-20	10.0-15.0	7.4-9.0	1-10	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---
Dast-----	0-5	2-18	10.0-15.0	7.4-8.4	1-5	---	---	---
	5-30	2-18	5.0-10.0	7.4-8.4	5-15	---	---	---
	30-60	---	---	---	---	---	---	---
203E:								
Cabba-----	0-6	27-35	15.0-20.0	7.4-9.0	5-10	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---
Doney-----	0-5	27-35	15.0-20.0	6.6-8.4	5-10	---	0-2	---
	5-32	18-30	10.0-15.0	7.9-9.0	5-15	---	2-4	---
	32-60	---	---	---	---	---	---	---
211F:								
Cabbart-----	0-4	10-20	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	4-16	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	16-60	---	---	---	---	---	---	---
Rock outcrop.								
212F:								
Cabbart-----	0-4	10-20	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	4-16	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	16-60	---	---	---	---	---	---	---
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
213E:								
Cabbart-----	0-4	18-27	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	4-16	18-35	5.0-10.0	7.4-9.0	15-25	1-5	2-8	1-5
	16-60	---	---	---	---	---	---	---
Delpoint-----	0-2	18-27	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	2-11	18-35	15.0-20.0	7.9-8.4	5-10	---	0-4	---
	11-24	18-35	10.0-15.0	7.9-8.4	5-15	---	0-4	---
	24-60	---	---	---	---	---	---	---
221E:								
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-9.0	1-5	---	0-2	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
222E:								
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
Neldore-----	0-6	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	6-18	40-60	30.0-35.0	5.6-7.8	5-15	---	0-4	---
	18-60	---	---	---	---	---	---	---
222F:								
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
Neldore-----	0-6	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	6-18	40-60	30.0-35.0	5.6-7.8	5-15	---	0-4	---
	18-60	---	---	---	---	---	---	---
224E:								
Hillon-----	0-5	20-27	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
Joplin-----	0-4	10-27	10.0-15.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
241C:								
Marmarth-----	0-3	20-27	15.0-20.0	6.1-7.3	---	---	---	---
	3-11	18-35	15.0-25.0	6.1-7.8	---	---	---	---
	11-32	15-30	10.0-20.0	7.4-8.4	5-10	---	---	---
	32-60	---	---	---	---	---	---	---
Evanston-----	0-6	20-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
251C:								
Bascovy-----	0-4	35-40	30.0-40.0	6.6-8.4	0-5	---	2-4	1-4
	4-13	40-60	30.0-35.0	6.1-8.4	1-5	---	2-4	5-10
	13-30	40-60	30.0-35.0	5.1-8.4	1-5	1-5	2-8	10-13
	30-60	---	---	---	---	---	---	---
252D:								
Bascovy-----	0-4	40-60	30.0-40.0	6.6-8.4	0-5	---	2-4	1-4
	4-13	40-60	30.0-35.0	6.1-8.4	1-5	---	2-4	5-10
	13-30	40-60	30.0-35.0	5.1-8.4	1-5	1-5	2-8	10-13
	30-60	---	---	---	---	---	---	---
Neldore-----	0-6	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	6-18	40-60	30.0-35.0	5.6-7.8	5-15	---	0-4	---
	18-60	---	---	---	---	---	---	---
261A:								
Absher-----	0-6	40-55	25.0-30.0	6.6-8.4	---	---	4-8	1-5
	6-13	35-60	25.0-30.0	6.6-8.4	---	---	8-16	18-70
	13-60	35-50	20.0-25.0	7.8-9.6	4-15	---	16	18-70
Nobe-----	0-1	27-40	20.0-25.0	6.6-8.4	---	---	4-8	0-13
	1-17	35-60	25.0-30.0	7.8-9.6	5-10	---	16	0-30
	17-60	35-60	25.0-30.0	7.8-9.6	5-10	---	16	13-40

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
272B:								
Attewan-----	0-4	10-15	5.0-10.0	6.1-7.3	---	---	---	---
	4-12	20-35	15.0-20.0	6.6-7.8	---	---	---	---
	12-27	15-30	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	27-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
300F:								
Rubble land.								
311B:								
Creed-----	0-5	27-35	20.0-25.0	6.1-8.4	---	---	0-4	---
	5-12	35-55	25.0-35.0	6.6-9.0	---	---	4-8	8-13
	12-60	25-35	15.0-20.0	7.9-9.0	5-10	---	4-16	13-25
Gerdum-----	0-4	27-40	20.0-25.0	6.6-7.8	---	---	0-2	---
	4-14	35-55	25.0-35.0	7.4-9.0	---	---	2-8	10-20
	14-60	10-20	15.0-20.0	7.9-9.0	5-15	---	8-16	13-30
Absher-----	0-6	40-55	25.0-30.0	6.6-8.4	---	---	4-8	1-5
	6-13	35-60	25.0-30.0	6.6-8.4	---	---	8-16	18-70
	13-60	35-50	20.0-25.0	7.8-9.6	4-15	---	16	18-70
321B:								
Kobase-----	0-12	27-40	25.0-30.0	7.4-8.4	5-10	---	0-2	1-5
	12-28	35-45	20.0-25.0	7.4-8.4	5-15	---	0-2	5-10
	28-60	35-45	20.0-25.0	7.9-9.0	5-15	1-5	0-4	8-13
321C:								
Kobase-----	0-12	27-40	25.0-30.0	7.4-8.4	5-10	---	0-2	1-5
	12-28	35-45	20.0-25.0	7.4-8.4	5-15	---	0-2	5-10
	28-60	35-45	20.0-25.0	7.9-9.0	5-15	1-5	0-4	8-13
323C:								
Sagedale-----	0-5	30-40	20.0-25.0	7.4-8.4	0-5	---	---	---
	5-12	32-45	20.0-25.0	7.4-8.4	---	---	0-2	---
	12-35	35-45	20.0-25.0	7.4-8.4	5-15	---	0-4	---
	35-60	35-45	20.0-25.0	7.4-9.0	5-10	---	0-4	---
331B:								
Phillips-----	0-7	27-35	15.0-20.0	6.1-7.3	---	---	0-2	---
	7-16	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	16-42	25-40	15.0-20.0	7.4-8.4	10-15	---	0-4	---
	42-60	20-35	15.0-20.0	7.4-8.4	5-10	---	4-8	---
Elloam-----	0-4	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	4-15	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	15-25	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	25-60	25-40	15.0-20.0	7.8-9.6	5-10	---	8-16	13-25
32B:								
Phillips-----	0-7	27-35	15.0-20.0	6.1-7.3	---	---	0-2	---
	7-16	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	16-42	25-40	15.0-20.0	7.4-8.4	10-15	---	0-4	---
	42-60	20-35	15.0-20.0	7.4-8.4	5-10	---	4-8	---
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	---	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-9.0	1-5	---	0-2	---



## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
364C:								
Chinook-----	0-6	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	6-23	5-18	5.0-10.0	6.6-9.0	---	---	0-2	---
	23-60	5-15	5.0-10.0	7.4-9.0	3-15	---	0-2	---
372B:								
Evanston-----	0-6	10-20	10.0-15.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
373C:								
Evanston-----	0-6	27-32	20.0-25.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
Tinsley-----	0-4	5-10	5.0-10.0	7.4-8.4	5-10	---	---	---
	4-60	0-10	1.0-5.0	7.4-8.4	2-10	---	0-2	---
374B:								
Evanston-----	0-6	20-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
374C:								
Evanston-----	0-6	20-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
378B:								
Evanston-----	0-6	27-32	20.0-25.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
Evanston, calcareous-----	0-6	27-32	15.0-20.0	7.4-8.4	5-10	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	1-5	---	0-2	---
	15-32	25-35	15.0-20.0	7.4-8.4	5-10	---	0-2	1-5
	32-60	15-30	10.0-15.0	7.9-8.4	5-10	---	0-4	5-10
379C:								
Evanston-----	0-6	27-32	20.0-25.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
Busby-----	0-5	10-18	10.0-15.0	7.4-8.4	5-10	---	---	---
	5-13	10-18	10.0-15.0	7.4-8.4	5-10	---	---	---
	13-32	10-18	5.0-15.0	7.9-8.4	5-15	---	0-2	---
	32-60	3-18	5.0-10.0	7.9-8.4	5-15	1-2	0-4	---
384B:								
Ethridge-----	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-15	35-45	25.0-30.0	6.6-8.4	---	---	---	---
	15-38	30-45	20.0-25.0	7.4-8.4	5-15	---	---	1-5
	38-60	25-40	20.0-25.0	7.4-8.4	5-15	1-3	2-4	1-5

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
<b>386B:</b>								
Ethridge-----	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-15	35-45	25.0-30.0	6.6-8.4	---	---	---	---
	15-38	30-45	20.0-25.0	7.4-8.4	5-15	---	---	1-5
	38-60	25-40	20.0-25.0	7.4-8.4	5-15	1-3	2-4	1-5
<b>Evanston-----</b>								
	0-6	27-32	20.0-25.0	6.6-7.8	---	---	---	---
	6-15	20-35	20.0-25.0	7.4-8.4	---	---	0-2	---
	15-32	20-35	20.0-25.0	7.4-8.4	5-15	---	0-2	---
	32-60	15-30	10.0-15.0	7.9-8.4	5-15	0-2	0-4	---
<b>391B:</b>								
Ferd-----	0-5	20-27	10.0-20.0	6.6-7.3	---	---	---	---
	5-9	22-35	10.0-25.0	6.6-7.8	---	---	---	---
	9-16	35-50	15.0-30.0	6.6-8.4	---	---	0-2	---
	16-41	27-40	10.0-25.0	7.9-9.0	5-15	---	2-8	0-13
	41-60	27-40	10.0-25.0	8.4-9.6	5-15	1-3	4-8	8-13
<b>Creed-----</b>								
	0-5	20-27	15.0-20.0	6.1-8.4	---	---	0-4	---
	5-12	35-55	25.0-35.0	6.6-9.0	---	---	4-8	8-13
	12-60	25-35	15.0-20.0	7.9-9.0	5-10	---	4-16	13-25
<b>Gerdum-----</b>								
	0-4	27-40	20.0-25.0	6.6-7.8	---	---	0-2	---
	4-14	35-55	25.0-35.0	7.4-9.0	---	---	2-8	10-20
	14-60	10-20	15.0-20.0	7.9-9.0	5-15	---	8-16	13-30
<b>391C:</b>								
Ferd-----	0-5	20-27	10.0-20.0	6.6-7.3	---	---	---	---
	5-7	22-35	10.0-25.0	6.6-7.8	---	---	---	---
	7-16	35-50	15.0-30.0	6.6-8.4	---	---	0-2	---
	16-41	27-40	10.0-25.0	7.9-9.0	5-15	---	2-8	0-13
	41-60	27-40	10.0-25.0	8.4-9.6	5-15	1-3	4-8	8-13
<b>Creed-----</b>								
	0-5	20-27	15.0-20.0	6.1-8.4	---	---	0-4	---
	5-12	35-55	25.0-35.0	6.6-9.0	---	---	4-8	8-13
	12-60	25-35	15.0-20.0	7.9-9.0	5-10	---	4-16	13-25
<b>Gerdum-----</b>								
	0-4	27-40	20.0-25.0	6.6-7.8	---	---	0-2	---
	4-14	35-55	25.0-35.0	7.4-9.0	---	---	2-8	10-20
	14-60	10-20	15.0-20.0	7.9-9.0	5-15	---	8-16	13-30
<b>402A:</b>								
Gerdum-----	0-4	27-40	20.0-25.0	6.6-7.8	---	---	0-2	---
	4-14	35-55	25.0-35.0	7.4-9.0	---	---	2-8	10-20
	14-60	10-20	15.0-20.0	7.9-9.0	5-15	---	8-16	13-30
<b>Absher-----</b>								
	0-6	40-55	25.0-30.0	6.6-8.4	---	---	4-8	1-5
	6-13	35-60	25.0-30.0	6.6-8.4	---	---	8-16	18-70
	13-60	35-50	20.0-25.0	7.8-9.6	4-15	---	16	18-70
<b>411B:</b>								
Reeder-----	0-6	27-33	---	6.1-7.3	---	---	---	---
	6-13	18-35	---	6.6-8.4	---	---	---	---
	13-32	15-30	---	7.4-8.4	6-20	---	0-2	---
	32-60	---	---	---	---	---	---	---
<b>Cabba-----</b>								
	0-6	10-20	10.0-15.0	7.4-9.0	---	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
411C:								
Reeder-----	0-6	27-33	---	6.1-7.3	---	---	---	---
	6-13	18-35	---	6.6-8.4	---	---	---	---
	13-32	15-30	---	7.4-8.4	6-20	---	0-2	---
	32-60	---	---	---	---	---	---	---
Cabba-----	0-6	10-20	10.0-15.0	7.4-9.0	---	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---
421C:								
Joplin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
421D:								
Joplin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
423B:								
Joplin, calcareous----	0-4	27-32	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	4-9	25-35	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	9-26	18-22	10.0-15.0	7.4-8.4	10-15	---	0-4	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
423C:								
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
Joplin, calcareous----	0-4	27-32	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	4-9	25-35	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	9-26	18-22	10.0-15.0	7.4-8.4	10-15	---	0-4	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
424C:								
Joplin-----	0-4	10-27	10.0-15.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-32	10.0-15.0	6.6-8.4	10-15	1-2	0-2	1-5
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	1-2	2-8	5-10
Hillon-----	0-5	20-27	15.0-20.0	7.4-8.4	5-10	---	---	---
	5-60	20-35	10.0-20.0	7.9-9.0	5-15	---	0-2	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
425C:								
Joplin, calcareous-----	0-4	27-32	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	4-9	25-35	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	9-26	18-22	10.0-15.0	7.4-8.4	10-15	---	0-4	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
Telstad-----	0-5	27-32	20.0-25.0	7.4-8.4	5-10	---	---	---
	5-19	25-35	20.0-25.0	7.4-8.4	5-10	---	---	---
	19-37	20-32	10.0-20.0	7.9-8.4	5-15	---	2-4	---
	37-60	20-32	10.0-15.0	7.9-9.0	5-12	---	2-4	---
426B:								
Joplin-----	0-4	10-27	10.0-15.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
427B:								
Joplin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
Joplin, calcareous-----	0-4	27-32	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	4-9	25-35	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	9-26	18-22	10.0-15.0	7.4-8.4	10-15	---	0-4	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
427C:								
Joplin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
Joplin, calcareous-----	0-4	27-32	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	4-9	25-35	15.0-20.0	7.4-8.4	5-10	---	0-4	---
	9-26	18-22	10.0-15.0	7.4-8.4	10-15	---	0-4	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
441C:								
Kevin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-26	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	26-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
Hillon-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-60	20-35	15.0-20.0	7.9-9.0	5-15	---	0-2	---
443B:								
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	---	5-0	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
Ferd-----	0-5	20-27	10.0-20.0	6.6-7.3	---	---	---	---
	5-9	22-35	10.0-25.0	6.6-7.8	---	---	---	---
	9-16	35-50	15.0-30.0	6.6-8.4	---	---	0-2	---
	16-41	27-40	10.0-25.0	7.9-9.0	5-15	---	2-8	0-13
	41-60	27-40	10.0-25.0	8.4-9.6	5-15	1-3	4-8	8-13

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
<b>444B:</b>								
Kevin, calcareous-----	0-5	27-32	15.0-20.0	7.4-8.4	5-10	---	---	---
	5-9	35-45	20.0-25.0	7.4-8.4	5-10	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	10-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
Ferd-----	0-5	20-27	10.0-20.0	6.6-7.3	---	---	---	---
	5-9	22-35	10.0-25.0	6.6-7.8	---	---	---	---
	9-16	35-50	15.0-30.0	6.6-8.4	---	---	0-2	---
	16-41	27-40	10.0-25.0	7.9-9.0	5-15	---	2-8	0-13
	41-60	27-40	10.0-25.0	8.4-9.6	5-15	1-3	4-8	8-13
<b>445B:</b>								
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
Kevin, calcareous-----	0-5	27-32	15.0-20.0	7.4-8.4	5-10	---	---	---
	5-9	35-45	20.0-25.0	7.4-8.4	5-10	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	10-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
<b>445C:</b>								
Kevin, calcareous-----	0-5	27-32	15.0-20.0	7.4-8.4	5-10	---	---	---
	5-9	35-45	20.0-25.0	7.4-8.4	5-10	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	10-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
<b>446C:</b>								
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
Elloam-----	0-4	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	4-15	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	15-25	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	25-60	25-40	15.0-20.0	7.8-9.6	5-10	---	8-16	13-25
<b>451A:</b>								
Cozberg-----	0-8	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	8-18	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	18-60	0-10	1.0-5.0	7.4-8.4	15-35	---	0-2	---
Lihen-----	0-10	10-20	10.0-15.0	6.1-8.4	---	---	---	---
	10-60	0-10	1.0-5.0	7.4-8.4	2-15	---	0-2	---
<b>451C:</b>								
Cozberg-----	0-8	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	8-18	10-18	10.0-15.0	6.6-7.8	---	---	---	---
	18-60	0-10	1.0-5.0	7.4-8.4	15-35	---	0-2	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
451C:								
Lihen-----	0-10	10-20	10.0-15.0	6.1-8.4	---	---	---	---
	10-60	0-10	1.0-5.0	7.4-8.4	2-15	---	0-2	---
481A:								
Bigsag-----	0-2	40-60	30.0-40.0	7.9-9.0	1-5	---	16	13-20
	2-16	35-60	30.0-40.0	8.5-9.0	5-15	3-5	16	20-40
	16-60	35-60	30.0-40.0	8.5-9.0	5-15	3-5	16	13-30
482A:								
Vanda-----	0-9	40-60	25.0-35.0	7.8-9.6	2-10	---	2-8	20-30
	9-60	35-60	20.0-30.0	7.8-9.6	1-5	---	8-16	13-30
Marvan-----	0-7	40-60	30.0-35.0	7.9-9.0	1-5	---	2-8	8-18
	7-30	45-60	30.0-35.0	7.9-9.0	5-10	---	2-8	13-38
	30-60	45-60	25.0-30.0	7.9-9.0	5-10	1-5	8-16	13-38
503B:								
Telstad-----	0-5	27-32	20.0-25.0	6.6-7.8	0-5	---	---	---
	5-19	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	19-37	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	37-60	20-32	15.0-20.0	7.9-8.4	3-12	---	2-4	---
Joplin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
503C:								
Telstad-----	0-5	27-32	20.0-25.0	6.6-7.8	0-5	---	---	---
	5-19	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	19-37	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	37-60	20-32	15.0-20.0	7.9-8.4	3-12	---	2-4	---
Joplin-----	0-4	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
504B:								
Telstad-----	0-5	18-27	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-19	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	19-37	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	37-60	20-32	15.0-20.0	7.9-8.4	3-12	---	2-4	---
Joplin-----	0-4	10-27	10.0-15.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---
504C:								
Telstad-----	0-5	18-27	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-19	25-35	20.0-25.0	6.6-8.4	---	---	---	---
	19-37	20-32	15.0-20.0	7.9-8.4	5-15	---	2-4	---
	37-60	20-32	15.0-20.0	7.9-8.4	3-12	---	2-4	---
Joplin-----	0-4	10-27	10.0-15.0	6.6-7.8	0-5	---	---	---
	4-9	25-35	15.0-20.0	6.6-7.8	---	---	---	---
	9-26	18-22	10.0-15.0	6.6-8.4	10-15	---	0-2	---
	26-60	18-32	10.0-15.0	7.4-8.4	5-10	---	2-8	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
511C: Turner-----	0-5	10-20	5.0-15.0	6.1-7.8	---	---	---	---
	5-15	25-35	10.0-25.0	6.6-8.4	---	---	---	---
	15-21	25-35	10.0-20.0	7.4-8.4	8-15	---	---	---
	21-60	0-5	1.0-5.0	7.4-8.4	2-12	---	0-2	---
521B: Elloam-----	0-4	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	4-15	35-55	25.0-30.0	6.6-9.0	---	---	2-8	8-25
	15-25	30-45	20.0-25.0	7.9-9.0	5-15	---	4-8	13-25
	25-60	25-40	15.0-20.0	7.8-9.6	5-10	---	8-16	13-25
Absher-----	0-6	27-40	20.0-25.0	6.6-8.4	---	---	4-8	1-5
	6-13	35-60	25.0-30.0	6.6-8.4	---	---	8-16	18-70
	13-60	35-50	20.0-25.0	7.8-9.6	4-15	---	16	18-70
551E: Lihen-----	0-10	5-10	5.0-10.0	6.1-8.4	---	---	---	---
	10-60	0-10	1.0-5.0	7.4-8.4	2-15	---	0-2	---
Blanchard-----	0-6	0-5	1.0-5.0	5.6-7.8	0-5	---	---	---
	6-60	0-5	1.0-5.0	6.6-7.8	5-10	---	---	---
561B: Scobey-----	0-6	27-35	20.0-25.0	6.1-7.8	0-5	---	---	---
	6-12	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	12-60	30-40	15.0-20.0	7.4-8.4	5-15	---	0-2	---
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
561C: Scobey-----	0-6	27-35	20.0-25.0	6.1-7.8	0-5	---	---	---
	6-12	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	12-60	30-40	15.0-20.0	7.4-8.4	5-15	---	0-2	---
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
561D: Scobey-----	0-6	27-35	20.0-25.0	6.1-7.8	0-5	---	---	---
	6-12	35-45	25.0-30.0	6.6-8.4	---	---	0-2	---
	12-60	30-40	15.0-20.0	7.4-8.4	5-15	---	0-2	---
Kevin-----	0-5	27-32	15.0-20.0	6.6-7.8	0-5	---	---	---
	5-9	35-45	20.0-25.0	6.6-8.4	---	---	---	---
	9-24	27-35	10.0-15.0	7.4-8.4	5-15	---	0-2	---
	24-60	27-35	10.0-15.0	7.9-8.4	1-5	---	0-2	---
563B: Scobey, calcareous----	0-6	27-35	20.0-25.0	7.4-8.4	5-10	---	---	---
	6-12	35-45	25.0-30.0	7.4-8.4	---	---	0-2	---
	12-60	30-40	15.0-20.0	7.4-8.4	5-15	---	0-2	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
571A:								
Ryell-----	0-5	15-27	15.0-20.0	7.4-8.4	0-5	---	0-2	---
	5-26	10-18	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	26-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
Rivra-----	0-5	5-15	5.0-10.0	6.6-8.4	2-10	---	---	---
	5-60	0-5	1.0-5.0	7.4-8.4	5-10	---	0-2	---
572A:								
Ryell-----	0-5	15-27	15.0-20.0	7.4-8.4	0-5	---	0-2	---
	5-26	10-18	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	26-60	0-10	1.0-5.0	7.4-8.4	5-10	---	0-2	---
Havre-----	0-6	15-27	15.0-20.0	7.4-8.4	0-5	---	0-2	---
	6-60	18-35	15.0-25.0	7.4-9.0	1-5	---	0-4	---
581B:								
Lonna-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-11	18-35	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	11-60	10-35	5.0-15.0	7.9-8.4	5-15	---	2-8	0-13
581C:								
Lonna-----	0-5	27-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-11	18-35	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	11-60	10-35	5.0-15.0	7.9-8.4	5-15	---	2-8	0-13
582B:								
Lonna-----	0-5	18-27	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	5-11	18-35	10.0-15.0	7.4-8.4	5-10	---	0-2	---
	11-60	10-35	5.0-15.0	7.9-8.4	5-15	---	2-8	0-13
Ethridge-----	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-15	35-45	25.0-30.0	6.6-8.4	---	---	---	---
	15-38	30-45	20.0-25.0	7.4-8.4	5-15	---	---	1-5
	38-60	25-40	20.0-25.0	7.4-8.4	5-15	1-3	2-4	1-5
601A:								
Havre-----	0-6	15-27	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	6-60	18-35	15.0-25.0	7.4-9.0	5-10	---	0-4	---
Glendive-----	0-8	5-15	10.0-15.0	6.6-9.0	1-10	---	0-4	---
	8-60	5-18	10.0-15.0	7.4-9.0	5-10	---	2-8	---
603A:								
Havre-----	0-6	15-27	15.0-20.0	7.4-8.4	1-5	---	0-2	---
	6-60	18-35	15.0-25.0	7.4-9.0	1-5	---	0-4	---
Glendive-----	0-5	5-15	10.0-15.0	6.6-9.0	1-5	---	0-4	---
	5-16	5-18	10.0-15.0	7.4-9.0	5-10	---	0-4	---
	16-60	5-18	10.0-15.0	7.4-9.0	5-10	---	2-8	---
651E:								
Fleak-----	0-4	5-15	5.0-10.0	6.6-7.8	5-10	---	---	---
	4-18	0-10	1.0-5.0	6.6-8.4	5-15	---	---	---
	18-60	---	---	---	---	---	---	---
Lihen-----	0-10	10-20	10.0-15.0	6.1-8.4	---	---	---	---
	10-60	0-10	1.0-5.0	7.4-8.4	2-15	---	0-2	---



## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
<b>673B:</b>								
<b>Bearpaw-----</b>	0-6	27-35	20.0-25.0	6.1-7.8	---	---	---	---
	6-13	35-50	25.0-30.0	6.6-8.4	---	---	---	---
	13-20	35-45	20.0-25.0	7.4-8.4	5-10	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-9.0	5-15	0-2	2-8	5-8
<b>Daglum-----</b>	0-9	27-35	15.0-30.0	6.1-7.8	---	---	---	---
	9-19	35-60	20.0-40.0	6.6-9.0	0-5	---	2-8	8-20
	19-60	35-60	20.0-35.0	7.9-9.0	5-15	2-5	8-16	13-30
<b>691B:</b>								
<b>Vida-----</b>	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
<b>Vida, calcareous-----</b>	0-4	27-30	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	4-9	25-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
<b>Williams-----</b>	0-5	27-35	20.0-25.0	6.6-7.3	0-5	---	---	---
	5-13	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---
<b>691C:</b>								
<b>Vida-----</b>	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
<b>Vida, calcareous-----</b>	0-4	27-30	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	4-9	25-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
<b>Williams-----</b>	0-5	27-35	20.0-25.0	6.6-7.3	0-5	---	---	---
	5-13	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---
<b>692D:</b>								
<b>Vida, calcareous-----</b>	0-4	27-30	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	4-9	25-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
<b>Williams-----</b>	0-5	27-35	20.0-25.0	6.6-7.3	0-5	---	---	---
	5-13	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---
<b>Zahill-----</b>	0-5	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-20	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	20-60	20-35	15.0-20.0	7.4-9.0	2-12	---	0-2	---
<b>694C:</b>								
<b>Vida-----</b>	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
<b>Williams-----</b>	0-5	27-35	20.0-25.0	6.6-7.3	0-5	---	---	---
	5-13	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
695D:								
Vida-----	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
Williams-----	0-5	27-35	20.0-25.0	6.6-7.3	0-5	---	---	---
	5-13	22-35	15.0-20.0	6.6-7.8	---	---	---	---
	13-60	22-35	15.0-20.0	7.9-8.4	5-15	---	---	---
Zahill-----	0-5	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-20	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	20-60	20-35	15.0-20.0	7.4-9.0	2-12	---	0-2	---
696E:								
Vida-----	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
Zahill-----	0-5	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-20	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	20-60	20-35	15.0-20.0	7.4-9.0	2-12	---	0-2	---
697C:								
Vida-----	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
Bearpaw-----	0-6	27-35	20.0-25.0	6.1-7.8	0-5	---	---	---
	6-13	35-50	25.0-30.0	6.6-8.4	---	---	---	---
	13-20	35-45	20.0-25.0	7.4-8.4	5-10	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-8.4	5-15	0-2	2-8	5-8
698D:								
Vida-----	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
Bearpaw-----	0-6	27-35	20.0-25.0	6.1-7.8	0-5	---	---	---
	6-13	35-50	25.0-30.0	6.6-8.4	---	---	---	---
	13-20	35-45	20.0-25.0	7.4-8.4	5-10	---	2-4	1-5
	20-60	30-45	20.0-25.0	7.4-8.4	5-15	0-2	2-8	5-8
Nishon-----	0-4	27-35	15.0-20.0	6.1-7.8	---	---	---	---
	4-22	40-60	30.0-35.0	6.6-9.0	---	---	0-2	---
	22-60	35-55	30.0-35.0	7.4-9.0	1-15	---	2-4	---
698E:								
Vida-----	0-4	27-30	15.0-20.0	6.6-8.4	0-5	---	0-2	---
	4-9	25-35	15.0-20.0	6.6-8.4	---	---	0-2	---
	9-60	25-35	15.0-20.0	7.9-8.4	5-15	---	0-2	---
Zahill-----	0-5	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-20	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	20-60	20-35	15.0-20.0	7.4-9.0	2-12	---	0-2	---
Nishon-----	0-4	27-35	15.0-20.0	6.1-7.8	---	---	---	---
	4-22	40-60	30.0-35.0	6.6-9.0	---	---	0-2	---
	22-60	35-55	30.0-35.0	7.4-9.0	1-15	---	2-4	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
721E:								
Zahill-----	0-5	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-20	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	20-60	20-35	15.0-20.0	7.4-9.0	2-12	---	0-2	---
Zahl-----	0-4	18-27	15.0-20.0	6.6-8.4	0-5	---	---	---
	4-8	20-30	15.0-20.0	7.4-8.4	---	---	---	---
	8-60	20-30	10.0-15.0	7.4-8.4	5-15	---	---	---
721F:								
Zahill-----	0-5	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-20	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	20-60	20-35	15.0-20.0	7.4-9.0	2-12	---	0-2	---
Zahl-----	0-4	18-27	15.0-20.0	6.6-8.4	0-5	---	---	---
	4-8	20-30	15.0-20.0	7.4-8.4	---	---	---	---
	8-60	20-30	10.0-15.0	7.4-8.4	5-15	---	---	---
722F:								
Zahill-----	0-5	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-20	25-35	15.0-20.0	7.4-8.4	8-15	---	0-2	---
	20-60	20-35	15.0-20.0	7.4-9.0	2-12	---	0-2	---
Dast-----	0-5	2-18	10.0-15.0	7.4-8.4	1-5	---	---	---
	5-30	2-18	5.0-10.0	7.4-8.4	5-15	---	---	---
	30-60	---	---	---	---	---	---	---
Cabba-----	0-6	10-20	10.0-15.0	7.4-9.0	1-10	---	0-4	---
	6-15	20-35	5.0-10.0	7.4-9.0	5-15	---	2-8	---
	15-60	---	---	---	---	---	---	---
743A:								
Shambo-----	0-6	10-27	15.0-20.0	6.6-7.8	---	---	---	---
	6-15	18-35	10.0-15.0	6.6-8.4	---	---	---	1-5
	15-60	10-20	5.0-10.0	7.4-8.4	5-10	---	---	1-5
Fairway-----	0-10	15-27	20.0-25.0	6.6-7.8	0-5	---	---	---
	10-30	18-27	15.0-20.0	6.6-7.8	5-15	---	---	---
	30-41	20-30	15.0-20.0	6.6-7.8	2-15	---	---	---
	41-60	0-10	1.0-5.0	6.6-7.8	0-15	---	---	---
761B:								
Fairway-----	0-10	15-27	20.0-25.0	6.6-7.8	---	---	---	---
	10-30	18-27	15.0-20.0	6.6-7.8	5-15	---	---	---
	30-41	20-30	15.0-20.0	6.6-7.8	2-15	---	---	---
	41-60	0-10	1.0-5.0	6.6-7.8	0-15	---	---	---
Bigsandy-----	0-5	15-27	20.0-25.0	7.4-9.0	5-15	---	0-4	0-4
	5-10	18-35	20.0-25.0	7.9-9.0	15-30	---	0-4	0-4
	10-32	18-35	15.0-20.0	8.5-9.0	15-30	---	4-8	5-13
	32-60	15-35	15.0-20.0	8.5-9.0	5-15	1-3	8-16	5-13
793B:								
Yamacall-----	0-6	16-27	15.0-20.0	7.4-8.4	5-10	---	---	---
	6-11	18-30	10.0-15.0	7.9-8.4	10-15	0-1	0-4	1-5
	11-60	10-30	10.0-15.0	7.9-8.4	5-10	---	0-4	1-5
793C:								
Yamacall-----	0-6	16-27	15.0-20.0	7.4-8.4	5-10	---	---	---
	6-11	18-30	10.0-15.0	7.9-8.4	10-15	0-1	0-4	1-5
	11-60	10-30	10.0-15.0	7.9-8.4	5-10	---	0-4	1-5

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
793D:								
Yamacall-----	0-6	16-27	15.0-20.0	7.4-8.4	5-10	---	---	---
	6-11	18-30	10.0-15.0	7.9-8.4	10-15	0-1	0-4	1-5
	11-60	10-30	10.0-15.0	7.9-8.4	5-10	---	0-4	1-5
831B:								
Enbar-----	0-18	18-27	20.0-25.0	6.6-8.4	1-5	---	---	---
	18-30	18-30	15.0-20.0	7.9-8.4	5-10	---	---	---
	30-50	10-27	10.0-15.0	7.9-8.4	5-10	---	0-2	---
	50-60	5-18	5.0-10.0	7.9-8.4	5-10	---	0-2	---
Bigsandy-----	0-5	15-27	20.0-25.0	7.4-9.0	0-5	---	0-4	0-4
	5-10	18-35	20.0-25.0	7.9-9.0	15-30	---	0-4	0-4
	10-32	18-35	15.0-20.0	8.5-9.0	15-30	---	4-8	5-13
	32-60	15-35	15.0-20.0	8.5-9.0	5-15	1-3	8-16	5-13
Korchea-----	0-14	18-27	15.0-20.0	6.6-8.4	1-5	---	---	---
	14-60	18-27	15.0-20.0	7.4-9.0	5-10	---	0-4	---
861F:								
Stemple-----	0-8	10-20	10.0-15.0	5.1-6.5	---	---	---	---
	8-32	10-20	15.0-20.0	5.1-6.5	---	---	---	---
	32-37	15-27	20.0-25.0	5.1-6.5	---	---	---	---
	37-60	27-35	10.0-15.0	5.6-6.5	---	---	---	---
Rubble land.								
862F:								
Stemple-----	0-8	10-20	10.0-15.0	5.1-6.5	---	---	---	---
	8-32	10-20	15.0-20.0	5.1-6.5	---	---	---	---
	32-37	15-27	20.0-25.0	5.1-6.5	---	---	---	---
	37-60	27-35	10.0-15.0	5.6-6.5	---	---	---	---
Rubble land.								
871B:								
Nesda-----	0-12	10-20	15.0-20.0	6.6-7.8	---	---	---	---
	12-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-2	---
Nesda, cool-----	0-10	10-20	15.0-20.0	6.6-7.8	1-5	---	---	---
	10-60	0-10	1.0-5.0	7.4-8.4	1-5	---	0-2	---
881E:								
Perma-----	0-10	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	10-30	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	30-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
Whitlash-----	0-9	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	9-19	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	19-60	---	---	---	---	---	---	---
881F:								
Perma-----	0-10	7-20	10.0-20.0	6.6-7.3	---	---	---	---
	10-30	7-20	10.0-15.0	6.6-7.8	---	---	---	---
	30-60	0-15	1.0-5.0	6.6-7.8	---	---	---	---
Whitlash-----	0-9	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	9-19	10-27	10.0-25.0	6.1-7.3	---	---	---	---
	19-60	---	---	---	---	---	---	---

## Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate equivalent	Gypsum	Salinity	Sodium adsorption ratio
	In	Pct	meq/100g	pH	Pct	Pct	mmhos/cm	
942C:								
Busby-----	0-5	10-18	10.0-15.0	7.4-8.4	5-10	---	---	---
	5-13	10-18	10.0-15.0	7.4-8.4	5-10	---	---	---
	13-32	10-18	5.0-15.0	7.9-8.4	5-15	---	0-2	---
	32-60	3-18	5.0-10.0	7.9-8.4	5-15	1-2	0-4	---
Chinook-----	0-6	5-18	10.0-15.0	6.6-8.4	---	---	0-2	---
	6-23	5-18	5.0-10.0	6.6-9.0	---	---	0-2	---
	23-60	5-15	5.0-10.0	7.4-9.0	3-15	---	0-2	---
961B:								
Macar-----	0-5	27-35	20.0-25.0	7.4-8.4	5-10	---	0-2	---
	5-12	18-35	15.0-20.0	7.4-8.4	5-10	---	0-2	---
	12-60	15-30	10.0-15.0	7.4-9.0	5-12	---	0-2	---
971C:								
Neldore-----	0-6	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	6-18	40-60	30.0-35.0	5.6-7.8	5-15	---	0-4	---
	18-60	---	---	---	---	---	---	---
Bascovy-----	0-4	40-60	30.0-40.0	6.6-8.4	0-5	---	2-4	1-4
	4-13	40-60	30.0-35.0	6.1-8.4	1-5	---	2-4	5-10
	13-30	40-60	30.0-35.0	5.1-8.4	1-5	1-5	2-8	10-13
	30-60	---	---	---	---	---	---	---
971F:								
Neldore-----	0-6	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	6-18	40-60	30.0-35.0	5.6-7.8	5-15	---	0-4	---
	18-60	---	---	---	---	---	---	---
Bascovy-----	0-4	40-60	30.0-40.0	6.6-8.4	0-5	---	2-4	1-4
	4-13	40-60	30.0-35.0	6.1-8.4	1-5	---	2-4	5-10
	13-30	40-60	30.0-35.0	5.1-8.4	1-5	1-5	2-8	10-13
	30-60	---	---	---	---	---	---	---
972F:								
Neldore-----	0-6	40-50	30.0-35.0	5.6-7.8	---	---	0-2	---
	6-18	40-60	30.0-35.0	5.6-7.8	5-15	---	0-4	---
	18-60	---	---	---	---	---	---	---
Lambeth-----	0-4	20-27	15.0-20.0	6.6-8.4	5-10	---	---	---
	4-60	20-35	15.0-20.0	7.9-9.0	10-15	1-5	0-4	1-5
Rock outcrop.								
DA:								
Denied access.								
M-W:								
Miscellaneous water.								
W:								
Water.								

## Water Features

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
2A: Riverwash-----	---	Frequent	Long	Apr-Jul	---	---	---	---	---
4B: Brockway-----	B	None	---	---	>6.0	---	---	---	---
4C: Brockway-----	B	None	---	---	>6.0	---	---	---	---
12C: Tally-----	B	None	---	---	>6.0	---	---	---	---
12D: Tally-----	B	None	---	---	>6.0	---	---	---	---
13B: Tanna-----	D	None	---	---	>6.0	---	---	---	---
13C: Tanna-----	D	None	---	---	>6.0	---	---	---	---
14A: McKenzie-----	D	None	---	---	---	---	Mar-Jun	Long	0.5
15F: Lambeth-----	B	None	---	---	>6.0	---	---	---	---
16B: Degrand-----	B	None	---	---	>6.0	---	---	---	---
19B: Kenilworth-----	C	None	---	---	>6.0	---	---	---	---
20C: Cabba-----	D	None	---	---	>6.0	---	---	---	---
20D: Cabba-----	D	None	---	---	>6.0	---	---	---	---
22E: Killon-----	C	None	---	---	>6.0	---	---	---	---
22F: Killon-----	C	None	---	---	>6.0	---	---	---	---
23A: Acel-----	C	None	---	---	>6.0	---	---	---	---
26B: Absher-----	D	None	---	---	>6.0	---	---	---	---
27B: Attewan-----	B	None	---	---	>6.0	---	---	---	---
28A: Nishon-----	D	None	---	---	---	---	Apr-Aug	Long	1.0
29B: Nunemaker-----	D	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
29C: Nunemaker-----	D	None	---	---	>6.0	---	---	---	---
30B: Marvan-----	D	None	---	---	>6.0	---	---	---	---
30C: Marvan-----	D	None	---	---	>6.0	---	---	---	---
32B: Kobase-----	C	None	---	---	>6.0	---	---	---	---
32C: Kobase-----	C	None	---	---	>6.0	---	---	---	---
33B: Phillips-----	C	None	---	---	>6.0	---	---	---	---
35B: Assinniboine----	B	None	---	---	>6.0	---	---	---	---
35C: Assinniboine----	B	None	---	---	>6.0	---	---	---	---
36C: Chinook-----	B	None	---	---	>6.0	---	---	---	---
37B: Evanston-----	B	None	---	---	>6.0	---	---	---	---
37C: Evanston-----	B	None	---	---	>6.0	---	---	---	---
38B: Ethridge-----	C	None	---	---	>6.0	---	---	---	---
39B: Ferd-----	C	None	---	---	>6.0	---	---	---	---
42B: Joplin-----	C	None	---	---	>6.0	---	---	---	---
42C: Joplin-----	C	None	---	---	>6.0	---	---	---	---
44B: Kevin-----	C	None	---	---	>6.0	---	---	---	---
44C: Kevin-----	C	None	---	---	>6.0	---	---	---	---
45C: Cozberg-----	B	None	---	---	>6.0	---	---	---	---
45D: Cozberg-----	B	None	---	---	>6.0	---	---	---	---
47B: Marias-----	D	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
48B: Vanda-----	D	None	---	---	>6.0	---	---	---	---
48C: Vanda-----	D	None	---	---	>6.0	---	---	---	---
49C: Flowerree-----	B	None	---	---	>6.0	---	---	---	---
50B: Telstad-----	C	None	---	---	>6.0	---	---	---	---
51B: Turner-----	B	None	---	---	>6.0	---	---	---	---
53D: Sunburst-----	C	None	---	---	>6.0	---	---	---	---
53E: Sunburst-----	C	None	---	---	>6.0	---	---	---	---
53F: Sunburst-----	C	None	---	---	>6.0	---	---	---	---
54B: Trudau-----	B	None	---	---	>6.0	---	---	---	---
58B: Lonna-----	B	None	---	---	>6.0	---	---	---	---
59B: Hedstrom-----	B	None	---	---	>6.0	---	---	---	---
60A: Havre-----	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
62A: Vaeda-----	D	None	---	---	>6.0	---	---	---	---
64B: Nobe-----	D	None	---	---	>6.0	---	---	---	---
67B: Bearpaw-----	C	None	---	---	>6.0	---	---	---	---
68B: Gerber-----	D	None	---	---	>6.0	---	---	---	---
69A: Vida-----	C	None	---	---	>6.0	---	---	---	---
69C: Vida-----	C	None	---	---	>6.0	---	---	---	---
71F: Roy-----	B	None	---	---	>6.0	---	---	---	---
72F: Zahill-----	C	None	---	---	>6.0	---	---	---	---



## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
73D: Yetull-----	A	None	---	---	>6.0	---	---	---	---
74B: Shambo-----	B	None	---	---	>6.0	---	---	---	---
75B: Farnuf-----	B	None	---	---	>6.0	---	---	---	---
75C: Farnuf-----	B	None	---	---	>6.0	---	---	---	---
77C: Tinsley-----	A	None	---	---	>6.0	---	---	---	---
77E: Tinsley-----	A	None	---	---	>6.0	---	---	---	---
79B: Yamacall-----	B	None	---	---	>6.0	---	---	---	---
79C: Yamacall-----	B	None	---	---	>6.0	---	---	---	---
79D: Yamacall-----	B	None	---	---	>6.0	---	---	---	---
80B: Williams-----	B	None	---	---	>6.0	---	---	---	---
80C: Williams-----	B	None	---	---	>6.0	---	---	---	---
82B: Savage-----	C	None	---	---	>6.0	---	---	---	---
85B: Benz-----	D	None	---	---	>6.0	---	---	---	---
88C: Perma-----	B	None	---	---	>6.0	---	---	---	---
88E: Perma-----	B	None	---	---	>6.0	---	---	---	---
90A: Harlake-----	C	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
94C: Busby-----	B	None	---	---	>6.0	---	---	---	---
94D: Busby-----	B	None	---	---	>6.0	---	---	---	---
96C: Macar-----	B	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
96D: Macar-----	B	None	---	---	>6.0	---	---	---	---
98B: Kremlin-----	B	None	---	---	>6.0	---	---	---	---
101A: Hanly-----	A	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
Glendive-----	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
Havre-----	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
110A: Korchea-----	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
Kiwanis-----	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
141A: McKenzie-----	D	None	---	---	---	---	Mar-Jun	Long	0.5
143A: Meadowcreek----	C	Rare	Brief	Jan-Jul	3.0-5.0	Apparent	Apr-Jun	---	---
144A: Bigsandy-----	D	Rare	Brief	Jan-Jul	1.0-2.0	Apparent	Dec-Jun	---	---
162B: Degrand-----	B	None	---	---	>6.0	---	---	---	---
171F: Delpoint-----	C	None	---	---	>6.0	---	---	---	---
Cabbart-----	D	None	---	---	>6.0	---	---	---	---
181D: Doney-----	C	None	---	---	>6.0	---	---	---	---
Cabba-----	D	None	---	---	>6.0	---	---	---	---
191B: Kenilworth-----	C	None	---	---	>6.0	---	---	---	---
200F: Badland-----		None	---	---	---	---	---	---	---
201F: Cabba-----	D	None	---	---	>6.0	---	---	---	---
Rock outcrop, mudstone.									
202F: Cabba-----	D	None	---	---	>6.0	---	---	---	---
Dast-----	B	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Pending duration	Maximum ponding depth
					Ft				Ft
203E:									
Cabba-----	D	None	---	---	>6.0	---	---	---	---
Doney-----	C	None	---	---	>6.0	---	---	---	---
211F:									
Cabbart-----	D	None	---	---	>6.0	---	---	---	---
Rock outcrop.									
212F:									
Cabbart-----	D	None	---	---	>6.0	---	---	---	---
Hillon-----	C	None	---	---	>6.0	---	---	---	---
213E:									
Cabbart-----	D	None	---	---	>6.0	---	---	---	---
Delpoint-----	C	None	---	---	>6.0	---	---	---	---
221E:									
Hillon-----	C	None	---	---	>6.0	---	---	---	---
Kevin-----	C	None	---	---	>6.0	---	---	---	---
222E:									
Hillon-----	C	None	---	---	>6.0	---	---	---	---
Neldore-----	D	None	---	---	>6.0	---	---	---	---
222F:									
Hillon-----	C	None	---	---	>6.0	---	---	---	---
Neldore-----	D	None	---	---	>6.0	---	---	---	---
224E:									
Hillon-----	C	None	---	---	>6.0	---	---	---	---
Joplin-----	C	None	---	---	>6.0	---	---	---	---
241C:									
Marmarth-----	C	None	---	---	>6.0	---	---	---	---
Evanston-----	B	None	---	---	>6.0	---	---	---	---
251C:									
Bascovy-----	D	None	---	---	>6.0	---	---	---	---
252D:									
Bascovy-----	D	None	---	---	>6.0	---	---	---	---
Neldore-----	D	None	---	---	>6.0	---	---	---	---
261A:									
Absher-----	D	None	---	---	>6.0	---	---	---	---
Nobe-----	D	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
272B: Attewan-----	B	None	---	---	>6.0	---	---	---	---
300F: Rubble land-----	---	None	---	---	---	---	---	---	---
311B: Creed-----	C	None	---	---	>6.0	---	---	---	---
Gerdum-----	D	None	---	---	>6.0	---	---	---	---
Absher-----	D	None	---	---	>6.0	---	---	---	---
321B: Kobase-----	C	None	---	---	>6.0	---	---	---	---
321C: Kobase-----	C	None	---	---	>6.0	---	---	---	---
323C: Sagedale-----	C	None	---	---	>6.0	---	---	---	---
331B: Phillips-----	C	None	---	---	>6.0	---	---	---	---
Elloam-----	D	None	---	---	>6.0	---	---	---	---
332B: Phillips-----	C	None	---	---	>6.0	---	---	---	---
Kevin-----	C	None	---	---	>6.0	---	---	---	---
364C: Chinook-----	B	None	---	---	>6.0	---	---	---	---
372B: Evanston-----	B	None	---	---	>6.0	---	---	---	---
373C: Evanston-----	B	None	---	---	>6.0	---	---	---	---
Tinsley-----	A	None	---	---	>6.0	---	---	---	---
374B: Evanston-----	B	None	---	---	>6.0	---	---	---	---
374C: Evanston-----	B	None	---	---	>6.0	---	---	---	---
378B: Evanston-----	B	None	---	---	>6.0	---	---	---	---
Evanston, calcareous-----	B	None	---	---	>6.0	---	---	---	---
379C: Evanston-----	B	None	---	---	>6.0	---	---	---	---
Busby-----	B	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
384B:									
Ethridge-----	C	None	---	---	>6.0	---	---	---	---
386B:									
Ethridge-----	C	None	---	---	>6.0	---	---	---	---
Evanston-----	B	None	---	---	>6.0	---	---	---	---
391B:									
Ferd-----	C	None	---	---	>6.0	---	---	---	---
Creed-----	C	None	---	---	>6.0	---	---	---	---
Gerdum-----	D	None	---	---	>6.0	---	---	---	---
391C:									
Ferd-----	C	None	---	---	>6.0	---	---	---	---
Creed-----	C	None	---	---	>6.0	---	---	---	---
Gerdum-----	D	None	---	---	>6.0	---	---	---	---
402A:									
Gerdum-----	D	None	---	---	>6.0	---	---	---	---
Absher-----	D	None	---	---	>6.0	---	---	---	---
411B:									
Reeder-----	C	None	---	---	>6.0	---	---	---	---
Cabba-----	D	None	---	---	>6.0	---	---	---	---
411C:									
Reeder-----	C	None	---	---	>6.0	---	---	---	---
Cabba-----	D	None	---	---	>6.0	---	---	---	---
421C:									
Joplin-----	C	None	---	---	>6.0	---	---	---	---
Hillon-----	C	None	---	---	>6.0	---	---	---	---
421D:									
Joplin-----	C	None	---	---	>6.0	---	---	---	---
Hillon-----	C	None	---	---	>6.0	---	---	---	---
423B:									
Joplin, calcareous-----	C	None	---	---	>6.0	---	---	---	---
Hillon-----	C	None	---	---	>6.0	---	---	---	---
423C:									
Hillon-----	C	None	---	---	>6.0	---	---	---	---
Joplin, calcareous-----	C	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
424C:									
Joplin-----	C	None	---	---	>6.0	---	---	---	---
Hillon-----	C	None	---	---	>6.0	---	---	---	---
425C:									
Joplin, calcareous----	C	None	---	---	>6.0	---	---	---	---
Telstad-----	C	None	---	---	>6.0	---	---	---	---
426B:									
Joplin-----	C	None	---	---	>6.0	---	---	---	---
427B:									
Joplin-----	C	None	---	---	>6.0	---	---	---	---
Joplin, calcareous----	C	None	---	---	>6.0	---	---	---	---
427C:									
Joplin-----	C	None	---	---	>6.0	---	---	---	---
Joplin, calcareous----	C	None	---	---	>6.0	---	---	---	---
441C:									
Kevin-----	C	None	---	---	>6.0	---	---	---	---
Hillon-----	C	None	---	---	>6.0	---	---	---	---
443B:									
Kevin-----	C	None	---	---	>6.0	---	---	---	---
Ferd-----	C	None	---	---	>6.0	---	---	---	---
444B:									
Kevin, calcareous----	C	None	---	---	>6.0	---	---	---	---
Ferd-----	C	None	---	---	>6.0	---	---	---	---
445B:									
Kevin-----	C	None	---	---	>6.0	---	---	---	---
Kevin, calcareous----	C	None	---	---	>6.0	---	---	---	---
445C:									
Kevin, calcareous----	C	None	---	---	>6.0	---	---	---	---
Kevin-----	C	None	---	---	>6.0	---	---	---	---
446C:									
Kevin-----	C	None	---	---	>6.0	---	---	---	---
Elloam-----	D	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
451A:									
Cozberg-----	B	None	---	---	>6.0	---	---	---	---
Lihen-----	A	None	---	---	>6.0	---	---	---	---
451C:									
Cozberg-----	B	None	---	---	>6.0	---	---	---	---
Lihen-----	A	None	---	---	>6.0	---	---	---	---
481A:									
Bigsag-----	D	Rare	Brief	Jan-Jul	1.5-3.0	Apparent	Dec-Jun	---	---
482A:									
Vanda-----	D	None	---	---	>6.0	---	---	---	---
Marvan-----	D	None	---	---	>6.0	---	---	---	---
503B:									
Telstad-----	C	None	---	---	>6.0	---	---	---	---
Joplin-----	C	None	---	---	>6.0	---	---	---	---
503C:									
Telstad-----	C	None	---	---	>6.0	---	---	---	---
Joplin-----	C	None	---	---	>6.0	---	---	---	---
504B:									
Telstad-----	C	None	---	---	>6.0	---	---	---	---
Joplin-----	C	None	---	---	>6.0	---	---	---	---
504C:									
Telstad-----	C	None	---	---	>6.0	---	---	---	---
Joplin-----	C	None	---	---	>6.0	---	---	---	---
511C:									
Turner-----	B	None	---	---	>6.0	---	---	---	---
521B:									
Elloam-----	D	None	---	---	>6.0	---	---	---	---
Absher-----	D	None	---	---	>6.0	---	---	---	---
551E:									
Lihen-----	A	None	---	---	>6.0	---	---	---	---
Blanchard-----	A	None	---	---	>6.0	---	---	---	---
561B:									
Scobey-----	C	None	---	---	>6.0	---	---	---	---
Kevin-----	C	None	---	---	>6.0	---	---	---	---
561C:									
Scobey-----	C	None	---	---	>6.0	---	---	---	---
Kevin-----	C	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
561D:									
Scobey-----	C	None	---	---	>6.0	---	---	---	---
Kevin-----	C	None	---	---	>6.0	---	---	---	---
563B:									
Scobey, calcareous-----	C	None	---	---	>6.0	---	---	---	---
571A:									
Ryell-----	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
Rivra-----	D	Occasional	Brief	Apr-Jun	---	---	---	---	---
572A:									
Ryell-----	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
Havre-----	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
581B:									
Lonna-----	B	None	---	---	>6.0	---	---	---	---
581C:									
Lonna-----	B	None	---	---	>6.0	---	---	---	---
582B:									
Lonna-----	B	None	---	---	>6.0	---	---	---	---
Ethridge-----	C	None	---	---	>6.0	---	---	---	---
601A:									
Havre-----	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
Glendive-----	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
603A:									
Havre-----	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
Glendive-----	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
651E:									
Fleak-----	D	None	---	---	>6.0	---	---	---	---
Lihen-----	A	None	---	---	>6.0	---	---	---	---
673B:									
Bearpaw-----	C	None	---	---	>6.0	---	---	---	---
Daglum-----	D	None	---	---	>6.0	---	---	---	---
691B:									
Vida-----	C	None	---	---	>6.0	---	---	---	---
Vida, calcareous-----	C	None	---	---	>6.0	---	---	---	---
Williams-----	B	None	---	---	>6.0	---	---	---	---



## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
691C:									
Vida-----	C	None	---	---	>6.0	---	---	---	---
Vida, calcareous-----	C	None	---	---	>6.0	---	---	---	---
Williams-----	B	None	---	---	>6.0	---	---	---	---
692D:									
Vida, calcareous-----	C	None	---	---	>6.0	---	---	---	---
Williams-----	B	None	---	---	>6.0	---	---	---	---
Zahill-----	C	None	---	---	>6.0	---	---	---	---
694C:									
Vida-----	C	None	---	---	>6.0	---	---	---	---
Williams-----	B	None	---	---	>6.0	---	---	---	---
695D:									
Vida-----	C	None	---	---	>6.0	---	---	---	---
Williams-----	B	None	---	---	>6.0	---	---	---	---
Zahill-----	C	None	---	---	>6.0	---	---	---	---
696E:									
Vida-----	C	None	---	---	>6.0	---	---	---	---
Zahill-----	C	None	---	---	>6.0	---	---	---	---
697C:									
Vida-----	C	None	---	---	>6.0	---	---	---	---
Bearpaw-----	C	None	---	---	>6.0	---	---	---	---
698D:									
Vida-----	C	None	---	---	>6.0	---	---	---	---
Bearpaw-----	C	None	---	---	>6.0	---	---	---	---
Nishon-----	D	None	---	---	---	---	Apr-Aug	Long	1.0
698E:									
Vida-----	C	None	---	---	>6.0	---	---	---	---
Zahill-----	C	None	---	---	>6.0	---	---	---	---
Nishon-----	D	None	---	---	---	---	Apr-Aug	Long	1.0
721E:									
Zahill-----	C	None	---	---	>6.0	---	---	---	---
Zahl-----	B	None	---	---	>6.0	---	---	---	---

## Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					Ft				Ft
721F:									
Zahill-----	C	None	---	---	>6.0	---	---	---	---
Zahl-----	B	None	---	---	>6.0	---	---	---	---
722F:									
Zahill-----	C	None	---	---	>6.0	---	---	---	---
Dast-----	B	None	---	---	>6.0	---	---	---	---
Cabba-----	D	None	---	---	>6.0	---	---	---	---
743A:									
Shambo-----	B	None	---	---	>6.0	---	---	---	---
Fairway-----	C	Rare	Brief	Jan-Jul	3.0-5.0	Apparent	Apr-Jun	---	---
761B:									
Fairway-----	C	Rare	Brief	Jan-Jul	3.0-5.0	Apparent	Apr-Jun	---	---
Bigsandy-----	D	Occasional	Long	Apr-Jun	1.0-2.0	Apparent	Dec-Jun	---	---
793B:									
Yamacall-----	B	None	---	---	>6.0	---	---	---	---
793C:									
Yamacall-----	B	None	---	---	>6.0	---	---	---	---
793D:									
Yamacall-----	B	None	---	---	>6.0	---	---	---	---
831B:									
Enbar-----	B	Occasional	Brief	Apr-Jun	3.0-5.0	Apparent	Apr-Jul	---	---
Bigsandy-----	D	Rare	Brief	Jan-Jul	1.0-2.0	Apparent	Dec-Jun	---	---
Korchea-----	B	Rare	Brief	Jan-Jul	>6.0	---	---	---	---
861F:									
Stemple-----	B	None	---	---	>6.0	---	---	---	---
Rubble land.									
862F:									
Stemple-----	B	None	---	---	>6.0	---	---	---	---
Rubble land.									
871B:									
Nesda-----	B	Rare	Brief	Jun-Jul	>6.0	---	---	---	---
Nesda, cool----	B	Occasional	Brief	Apr-Jun	>6.0	---	---	---	---
881E:									
Perma-----	B	None	---	---	>6.0	---	---	---	---
Whitlash-----	D	None	---	---	>6.0	---	---	---	---

[illegible]

## Soil Features

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
2A: Riverwash.					
4B: Brockway-----	>60	---	Moderate	High	Moderate
4C: Brockway-----	>60	---	Moderate	High	Moderate
12C: Tally-----	>60	---	Moderate	High	Low
12D: Tally-----	>60	---	Moderate	High	Low
13B: Tanna-----	20-40	Soft	Low	High	Low
13C: Tanna-----	20-40	Soft	Low	High	Low
14A: McKenzie-----	>60	---	Low	High	Low
15F: Lambeth-----	>60	---	Moderate	High	Low
16B: Degrand-----	>60	---	Moderate	High	Low
19B: Kenilworth-----	>60	---	Moderate	High	Low
20C: Cabba-----	10-20	Soft	Moderate	High	Low
20D: Cabba-----	10-20	Soft	Moderate	High	Low
22E: Hillon-----	>60	---	Moderate	High	Low
22F: Hillon-----	>60	---	Moderate	High	Low
23A: Acel-----	>60	---	Low	High	Low
26B: Absher-----	>60	---	Low	High	Moderate
27B: Attewan-----	>60	---	Moderate	High	Low
28A: Nishon-----	>60	---	Moderate	High	Low
29B: Nunemaker-----	>60	---	Low	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
29C:					
Nunemaker-----	>60	---	Low	High	Low
30B:					
Marvan-----	>60	---	Low	High	Moderate
30C:					
Marvan-----	>60	---	Low	High	Moderate
32B:					
Kobase-----	>60	---	Low	High	Low
32C:					
Kobase-----	>60	---	Low	High	Low
33B:					
Phillips-----	>60	---	Low	High	Low
35B:					
Assinniboine----	>60	---	Moderate	High	Low
35C:					
Assinniboine----	>60	---	Moderate	High	Low
36C:					
Chinook-----	>60	---	Moderate	High	Low
37B:					
Evanston-----	>60	---	Moderate	High	Low
37C:					
Evanston-----	>60	---	Moderate	High	Low
38B:					
Ethridge-----	>60	---	Low	High	Low
39B:					
Ferd-----	>60	---	Low	High	Low
42B:					
Joplin-----	>60	---	Moderate	High	Low
42C:					
Joplin-----	>60	---	Moderate	High	Low
44B:					
Kevin-----	>60	---	Moderate	High	Low
44C:					
Kevin-----	>60	---	Moderate	High	Low
45C:					
Cozberg-----	>60	---	Moderate	High	Low
45D:					
Cozberg-----	>60	---	Moderate	High	Low
47B:					
Marias-----	>60	---	Low	High	Low
48B:					
Vanda-----	>60	---	Low	High	Moderate

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
48C: Vanda-----	>60	---	Low	High	Moderate
49C: Floweree-----	>60	---	Moderate	High	Low
50B: Telstad-----	>60	---	Low	High	Low
51B: Turner-----	>60	---	Moderate	High	Low
53D: Sunburst-----	>60	---	Low	High	Low
53E: Sunburst-----	>60	---	Low	High	Low
53F: Sunburst-----	>60	---	Low	High	Low
54B: Trudau-----	>60	---	Moderate	High	High
58B: Lonna-----	>60	---	Moderate	High	Low
59B: Hedstrom-----	>60	---	Moderate	High	Low
60A: Havre-----	>60	---	Moderate	High	Low
62A: Vaeda-----	>60	---	Low	High	High
64B: Nobe-----	>60	---	Low	High	High
67B: Bearpaw-----	>60	---	Moderate	High	Moderate
68B: Gerber-----	>60	---	Low	High	Low
69A: Vida-----	>60	---	Moderate	High	Low
69C: Vida-----	>60	---	Moderate	High	Low
71F: Roy-----	>60	---	Moderate	High	Low
72F: Zahill-----	>60	---	Moderate	High	Low
73D: Yetull-----	>60	---	Low	High	Low
74B: Shambo-----	>60	---	Moderate	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
75B: Farnuf-----	>60	---	Moderate	High	Low
75C: Farnuf-----	>60	---	Moderate	High	Low
77C: Tinsley-----	>60	---	Low	High	Low
77E: Tinsley-----	>60	---	Low	High	Low
79B: Yamacall-----	>60	---	Moderate	High	Low
79C: Yamacall-----	>60	---	Moderate	High	Low
79D: Yamacall-----	>60	---	Moderate	High	Low
80B: Williams-----	>60	---	Moderate	High	Low
80C: Williams-----	>60	---	Moderate	High	Low
82B: Savage-----	>60	---	Low	High	Low
85B: Benz-----	>60	---	Moderate	High	Low
88C: Perma-----	>60	---	Moderate	Moderate	Low
88E: Perma-----	>60	---	Moderate	Moderate	Low
90A: Harlake-----	>60	---	Low	High	Low
94C: Busby-----	>60	---	Moderate	High	Low
94D: Busby-----	>60	---	Moderate	High	Low
96C: Macar-----	>60	---	Moderate	High	Low
96D: Macar-----	>60	---	Moderate	High	Low
98B: Kremlin-----	>60	---	Moderate	High	Low
101A: Hanly-----	>60	---	Low	Moderate	Low
Glendive-----	>60	---	Moderate	High	Low
Havre-----	>60	---	Moderate	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
110A:					
Korchea-----	>60	---	Moderate	High	Low
Kiwanis-----	>60	---	Moderate	High	Low
141A:					
McKenzie-----	>60	---	Low	High	High
143A:					
Meadowcreek-----	>60	---	High	Moderate	Low
144A:					
Bigsandy-----	>60	---	High	High	High
162B:					
Degradand-----	>60	---	Moderate	High	Low
171F:					
Delpoint-----	20-40	Soft	Moderate	High	Low
Cabbart-----	10-20	Soft	Moderate	High	Low
181D:					
Doney-----	20-40	Soft	Moderate	High	Low
Cabba-----	10-20	Soft	Moderate	High	Low
191B:					
Kenilworth-----	>60	---	Moderate	High	Low
200F:					
Badland.					
201F:					
Cabba-----	10-20	Soft	Moderate	High	Low
Rock outcrop, mudstone.					
202F:					
Cabba-----	10-20	Soft	Moderate	High	Low
Dast-----	20-40	Soft	Moderate	High	Low
203E:					
Cabba-----	10-20	Soft	Moderate	High	Low
Doney-----	20-40	Soft	Moderate	High	Low
211F:					
Cabbart-----	10-20	Soft	Moderate	High	Low
Rock outcrop.					
212F:					
Cabbart-----	10-20	Soft	Moderate	High	Low
Hillon-----	>60	---	Moderate	High	Low
213E:					
Cabbart-----	10-20	Soft	Moderate	High	Low



## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
221E:					
Hillon-----	>60	---	Moderate	High	Low
Kevin-----	>60	---	Moderate	High	Low
222E:					
Hillon-----	>60	---	Moderate	High	Low
Neldore-----	10-20	Soft	Low	High	Moderate
222F:					
Hillon-----	>60	---	Moderate	High	Low
Neldore-----	10-20	Soft	Low	High	Moderate
224E:					
Hillon-----	>60	---	Moderate	High	Low
Joplin-----	>60	---	Moderate	High	Low
241C:					
Marmarth-----	20-40	Soft	Moderate	High	Low
Evanston-----	>60	---	Moderate	High	Low
251C:					
Bascovy-----	20-40	Soft	Low	High	High
252D:					
Bascovy-----	20-40	Soft	Low	High	High
Neldore-----	10-20	Soft	Low	High	Moderate
261A:					
Absher-----	>60	---	Low	High	Moderate
Nobe-----	>60	---	Low	High	High
272B:					
Attewan-----	>60	---	Moderate	High	Low
300F:					
Rubble land.					
311B:					
Creed-----	>60	---	Low	High	Moderate
Gerdum-----	>60	---	Low	High	Moderate
Absher-----	>60	---	Low	High	Moderate
321B:					
Kobase-----	>60	---	Low	High	Low
321C:					
Kobase-----	>60	---	Low	High	Low
323C:					
Sagedale-----	>60	---	Low	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
331B:					
Phillips-----	>60	---	Low	High	Low
Elloam-----	>60	---	Low	High	High
332B:					
Phillips-----	>60	---	Low	High	Low
Kevin-----	>60	---	Moderate	High	Low
364C:					
Chinook-----	>60	---	Moderate	High	Low
372B:					
Evanston-----	>60	---	Moderate	High	Low
373C:					
Evanston-----	>60	---	Moderate	High	Low
Tinsley-----	>60	---	Low	High	Low
374B:					
Evanston-----	>60	---	Moderate	High	Low
374C:					
Evanston-----	>60	---	Moderate	High	Low
378B:					
Evanston-----	>60	---	Moderate	High	Low
Evanston, calcareous-----	>60	---	Moderate	High	Low
379C:					
Evanston-----	>60	---	Moderate	High	Low
Busby-----	>60	---	Moderate	High	Low
384B:					
Ethridge-----	>60	---	Low	High	Low
386B:					
Ethridge-----	>60	---	Low	High	Low
Evanston-----	>60	---	Moderate	High	Low
391B:					
Ferd-----	>60	---	Low	High	Low
Creed-----	>60	---	Low	High	Moderate
Gerdrum-----	>60	---	Low	High	Moderate
391C:					
Ferd-----	>60	---	Low	High	Low
Creed-----	>60	---	Low	High	Moderate
Gerdrum-----	>60	---	Low	High	Moderate

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
402A:					
Gerdum-----	>60	---	Low	High	Moderate
Absher-----	>60	---	Low	High	Moderate
411B:					
Reeder-----	20-40	Soft	Moderate	High	Low
Cabba-----	10-20	Soft	Moderate	High	Low
411C:					
Reeder-----	20-40	Soft	Moderate	High	Low
Cabba-----	10-20	Soft	Moderate	High	Low
421C:					
Joplin-----	>60	---	Moderate	High	Low
Hillon-----	>60	---	Moderate	High	Low
421D:					
Joplin-----	>60	---	Moderate	High	Low
Hillon-----	>60	---	Moderate	High	Low
423B:					
Joplin, calcareous-----	>60	---	Moderate	High	Low
Hillon-----	>60	---	Moderate	High	Low
423C:					
Hillon-----	>60	---	Moderate	High	Low
Joplin, calcareous-----	>60	---	Moderate	High	Low
424C:					
Joplin-----	>60	---	Moderate	High	Low
Hillon-----	>60	---	Moderate	High	Low
425C:					
Joplin, calcareous-----	>60	---	Moderate	High	Low
Telstad-----	>60	---	Low	High	Low
426B:					
Joplin-----	>60	---	Moderate	High	Low
427B:					
Joplin-----	>60	---	Moderate	High	Low
Joplin, calcareous-----	>60	---	Moderate	High	Low
427C:					
Joplin-----	>60	---	Moderate	High	Low
Joplin, calcareous-----	>60	---	Moderate	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
441C:					
Kevin-----	>60	---	Moderate	High	Low
Hillon-----	>60	---	Moderate	High	Low
443B:					
Kevin-----	>60	---	Moderate	High	Low
Ferd-----	>60	---	Low	High	Low
444B:					
Kevin, calcareous----	>60	---	Moderate	High	Low
Ferd-----	>60	---	Low	High	Low
445B:					
Kevin-----	>60	---	Moderate	High	Low
Kevin, calcareous----	>60	---	Moderate	High	Low
445C:					
Kevin, calcareous----	>60	---	Moderate	High	Low
Kevin-----	>60	---	Moderate	High	Low
446C:					
Kevin-----	>60	---	Moderate	High	Low
Elloam-----	>60	---	Low	High	High
451A:					
Cozberg-----	>60	---	Moderate	High	Low
Lihen-----	>60	---	Low	High	Low
451C:					
Cozberg-----	>60	---	Moderate	High	Low
Lihen-----	>60	---	Low	High	Low
481A:					
Bigsag-----	>60	---	Moderate	High	High
482A:					
Vanda-----	>60	---	Low	High	Moderate
Marvan-----	>60	---	Low	High	Moderate
503B:					
Telstad-----	>60	---	Low	High	Low
Joplin-----	>60	---	Moderate	High	Low
503C:					
Telstad-----	>60	---	Low	High	Low
Joplin-----	>60	---	Moderate	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
504B:					
Telstad-----	>60	---	Low	High	Low
Joplin-----	>60	---	Moderate	High	Low
504C:					
Telstad-----	>60	---	Low	High	Low
Joplin-----	>60	---	Moderate	High	Low
511C:					
Turner-----	>60	---	Moderate	High	Low
521B:					
Elloam-----	>60	---	Low	High	High
Absher-----	>60	---	Low	High	Moderate
551E:					
Lihen-----	>60	---	Low	High	Low
Blanchard-----	>60	---	Low	Moderate	Moderate
561B:					
Scobey-----	>60	---	Low	High	Low
Kevin-----	>60	---	Moderate	High	Low
561C:					
Scobey-----	>60	---	Low	High	Low
Kevin-----	>60	---	Moderate	High	Low
561D:					
Scobey-----	>60	---	Low	High	Low
Kevin-----	>60	---	Moderate	High	Low
563B:					
Scobey, calcareous-----	>60	---	Low	High	Low
571A:					
Ryell-----	>60	---	Moderate	High	Low
Rivra-----	>60	---	Low	High	Low
572A:					
Ryell-----	>60	---	Moderate	High	Low
Havre-----	>60	---	Moderate	High	Low
581B:					
Lonna-----	>60	---	Moderate	High	Low
581C:					
Lonna-----	>60	---	Moderate	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
582B:					
Lonna-----	>60	---	Moderate	High	Low
Ethridge-----	>60	---	Low	High	Low
601A:					
Havre-----	>60	---	Moderate	High	Low
Glendive-----	>60	---	Moderate	High	Low
603A:					
Havre-----	>60	---	Moderate	High	Low
Glendive-----	>60	---	Moderate	High	Low
651E:					
Fleak-----	10-20	Soft	Low	Moderate	Low
Lihen-----	>60	---	Low	High	Low
673B:					
Bearpaw-----	>60	---	Moderate	High	Moderate
Daglum-----	>60	---	Moderate	High	Moderate
691B:					
Vida-----	>60	---	Moderate	High	Low
Vida, calcareous-----	>60	---	Moderate	High	Low
Williams-----	>60	---	Moderate	High	Low
691C:					
Vida-----	>60	---	Moderate	High	Low
Vida, calcareous-----	>60	---	Moderate	High	Low
Williams-----	>60	---	Moderate	High	Low
692D:					
Vida, calcareous-----	>60	---	Moderate	High	Low
Williams-----	>60	---	Moderate	High	Low
Zahill-----	>60	---	Moderate	High	Low
694C:					
Vida-----	>60	---	Moderate	High	Low
Williams-----	>60	---	Moderate	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
695D:					
Vida-----	>60	---	Moderate	High	Low
Williams-----	>60	---	Moderate	High	Low
Zahill-----	>60	---	Moderate	High	Low
696E:					
Vida-----	>60	---	Moderate	High	Low
Zahill-----	>60	---	Moderate	High	Low
697C:					
Vida-----	>60	---	Moderate	High	Low
Bearpaw-----	>60	---	Moderate	High	Moderate
698D:					
Vida-----	>60	---	Moderate	High	Low
Bearpaw-----	>60	---	Moderate	High	Moderate
Nishon-----	>60	---	Moderate	High	Low
698E:					
Vida-----	>60	---	Moderate	High	Low
Zahill-----	>60	---	Moderate	High	Low
Nishon-----	>60	---	Moderate	High	Low
721E:					
Zahill-----	>60	---	Moderate	High	Low
Zahl-----	>60	---	Moderate	Moderate	Low
721F:					
Zahill-----	>60	---	Moderate	High	Low
Zahl-----	>60	---	Moderate	Moderate	Low
722F:					
Zahill-----	>60	---	Moderate	High	Low
Dast-----	20-40	Soft	Moderate	High	Low
Cabba-----	10-20	Soft	Moderate	High	Low
743A:					
Shambo-----	>60	---	Moderate	High	Low
Fairway-----	>60	---	High	High	Low
761B:					
Fairway-----	>60	---	High	High	Low
Bigsandy-----	>60	---	High	High	High
793B:					
Yamacall-----	>60	---	Moderate	High	Low

## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
793C:					
Yamacall-----	>60	---	Moderate	High	Low
793D:					
Yamacall-----	>60	---	Moderate	High	Low
831B:					
Enbar-----	>60	---	High	High	Low
Bigsandy-----	>60	---	High	High	High
Korchea-----	>60	---	Moderate	High	Low
861F:					
Stemple-----	>60	---	Moderate	Moderate	Moderate
Rubble land.					
862F:					
Stemple-----	>60	---	Moderate	Moderate	Moderate
Rubble land.					
871B:					
Nesda-----	>60	---	Low	High	Low
Nesda, cool-----	>60	---	Low	High	Low
881E:					
Perma-----	>60	---	Moderate	Moderate	Low
Whitlash-----	10-20	Hard	Moderate	High	Low
881F:					
Perma-----	>60	---	Moderate	Moderate	Low
Whitlash-----	10-20	Hard	Moderate	High	Low
942C:					
Busby-----	>60	---	Moderate	High	Low
Chinook-----	>60	---	Moderate	High	Low
961B:					
Macar-----	>60	---	Moderate	High	Low
971C:					
Neldore-----	10-20	Soft	Low	High	Moderate
Bascovy-----	20-40	Soft	Low	High	High
971F:					
Neldore-----	10-20	Soft	Low	High	Moderate
Bascovy-----	20-40	Soft	Low	High	High
972F:					
Neldore-----	10-20	Soft	Low	High	Moderate
Lambeth-----	>60	---	Moderate	High	Low
Rock outcrop.					



## Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
DA: Denied access.					
M-W: Miscellaneous water.					
W: Water.					



## References

---

- Alexander, R.R. 1966. Site indexes for lodgepole pine with corrections for stand density. U.S. Dep. Agric., Forest Serv., Res. Pap. RM-24.
- American Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 14, 2 vols.
- American Society for Testing and Materials. 1993. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.
- Colton, Roger B., Richard W. Lemke, and Robert M. Lindral. 1961. Glacial map of Montana east of the Rocky Mountains. U.S. Geol. Surv., Misc. Geol. Invest. Map I-327.
- Dahms, W. G. 1964. Gross and net yields for lodgepole pine. U.S. Dep. Agric., Forest Serv., Res. Pap. PNW-8.
- Meyers, C. A. 1966. Yield tables for managed stands of lodgepole pine in Colorado and Wyoming. U.S. Dep. Agric., Forest Serv., Rocky Mountain For. and Range Exp. Str. Res. Pap. RM-26.
- United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210
- United States Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436.



# Glossary

---

**Ablation till.** Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alluvial fan.** A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Animal-unit-month (AUM).** The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

**Area reclaim** (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Argillite.** Weakly metamorphosed mudstone or shale.

**Association, soil.** A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low ..... 0 to 3.75

Low ..... 3.75 to 5.0

Moderate ..... 5.0 to 7.5

High ..... more than 7.5

**Avalanche chute.** The track or path formed by an avalanche.

**Back slope.** The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

**Badland.** Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

**Basal area.** The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

**Basal till.** Compact glacial till deposited beneath the ice.

**Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

**Bedding planes.** Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bedrock-floored plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

**Bench terrace.** A raised, level or nearly level strip of earth constructed on or nearly on a contour,

supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

**Blowout.** A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

**Board foot.** A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board one foot wide, one foot long, and one inch thick before finishing.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Breaks.** The steep or very steep broken land at the border of an upland summit that is dissected by ravines.

**Breast height.** An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

**Brush management.** Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

**Cable yarding.** A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

**California bearing ratio (CBR).** The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be

supported by standard crushed limestone, per unit area, with the same degree of distortion.

**Canopy.** The leafy crown of trees or shrubs. (See Crown.)

**Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

**Catsteps.** Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

**Channeled.** Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

**Channery soil.** A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

**Chemical treatment.** Control of unwanted vegetation by use of chemicals.

**Chiseling.** Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

**Cirque.** A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clayey soil.** Silty clay, sandy clay, or clay.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

**Claypan.** A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

**Clearcut.** A method of forest harvesting that removes the entire stand of trees in one cutting.

Reproduction is achieved artificially or by natural seeding from adjacent stands.

**Climax plant community.** The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

**Closed depression.** A low area completely surrounded by higher ground and having no natural outlet.

**Coarse textured soil.** Sand or loamy sand.

**Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Cobbly soil material.** Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

**Codominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

**Colluvium.** Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Commercial forest.** Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

**Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

**Compressible** (in tables). Excessive decrease in volume of soft soil under load.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Conglomerate.** A coarse grained, clastic rock composed of rounded to subangular rock

fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

**Conservation cropping system.** Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

**Conservation tillage.** Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Consolidated sandstone.** Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very

hard when dry, are not easily crushed, and cannot be textured by the usual field method.

**Consolidated shale.** Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

**Contour stripcropping (or contour farming).** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

**Coprogenous earth (sedimentary peat).** Fecal material deposited in water by aquatic organisms.

**Corrosion.** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

**Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

**Cropping system.** Growing crops according to a planned system of rotation and management practices.

**Crop residue management.** Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

**Cross-slope farming.** Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

**Crown.** The upper part of a tree or shrub, including the living branches and their foliage.

**Culmination of mean annual increment (CMAI).** The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of mean annual increment.

**Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.

**Decreasers.** The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

**Deep soil.** A soil that is 40 to 60 inches deep over

bedrock or to other material that restricts the penetration of plant roots.

**Deferred grazing.** Postponing grazing or resting grazing land for a prescribed period.

**Dense layer** (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

**Depth to rock** (in tables). Bedrock is too near the surface for the specified use.

**Dip slope.** A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Divided-slope farming.** A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.

**Dominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

**Drainage class (natural).** Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

*Somewhat excessively drained.*—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

*Well drained.*—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

*Moderately well drained.*—These soils are wet



close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

*Somewhat poorly drained.*—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

*Poorly drained.*—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

*Very poorly drained.*—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Drainageway.** An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

**Drumlin.** A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

**Duff.** A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

**Dune.** A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

**Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material

through eluviation are eluvial; those that have received material are illuvial.

**Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

**Ephemeral stream.** A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion (geologic).* Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

*Erosion (accelerated).* Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

**Erosion pavement.** A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

**Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

**Esker.** A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

**Even aged.** Refers to a stand of trees in which only small differences in age occur between the individuals. A range of 20 years is allowed.

**Excess fines** (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

**Excess lime** (in tables). Excess carbonates in the soil that restrict the growth of some plants.

**Excess salts** (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

**Excess sodium** (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

**Excess sulfur** (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

**Extrusive rock.** Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

**Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

**Fast intake** (in tables). The rapid movement of water into the soil.

**Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fine textured soil.** Sandy clay, silty clay, or clay.

**Firebreak.** An area cleared of flammable material to stop or help control creeping or running fires. A firebreak also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

**First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.

**Flaggy soil material.** Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

**Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is

usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.

**Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.

**Foothills.** A region of relatively low, rounded hills at the base of a mountain range.

**Foot slope.** The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

**Forb.** Any herbaceous plant not a grass or a sedge.

**Forest cover.** All trees and other woody plants (underbrush) covering the ground in a forest.

**Forest type.** A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

**Fragile** (in tables). A soil that is easily damaged by use or disturbance.

**Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

**Frost action** (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

**Giant ripple mark.** The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

**Glacial drift (geology).** Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

**Glacial outwash (geology).** Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

**Glacial till (geology).** Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

**Glaciated uplands.** Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

**Glaciofluvial deposits (geology).** Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

**Glaciolacustrine deposits.** Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

**Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

**Green manure crop (agronomy).** A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water (geology).** Water filling all the unblocked pores of the material below the water table.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. A gullied map unit is one that has numerous gullies.

**Gypsum.** A mineral consisting of hydrous calcium sulfate.

**Habitat type.** An aggregation of all land areas capable of producing similar climax plant communities.

**Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

**Hardpan.** A hardened or cemented soil horizon, or

layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Head out.** To form a flower head.

**Heavy metal.** Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

**Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

**High-residue crops.** Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

**Hill.** A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue.

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

**C horizon.**—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

**Cr horizon.**—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

**R layer.**—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Igneous rock.** Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Increasers.** Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

**Infiltration.** The downward entry of water into the

contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2 .....	very low
0.2 to 0.4 .....	low
0.4 to 0.75 .....	moderately low
0.75 to 1.25 .....	moderate
1.25 to 1.75 .....	moderately high
1.75 to 2.5 .....	high
More than 2.5 .....	very high

**Intermittent stream.** A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

**Invaders.** On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

**Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are:

**Basin.**—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

**Border.**—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

**Controlled flooding.**—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

**Corrugation.**—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

**Drip (or trickle).**—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

*Subirrigation.*—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

*Wild flooding.*—Water, released at high points, is allowed to flow onto an area without controlled distribution.

**Kame.** A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

**Kame terrace.** A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

**Lacustrine deposit (geology).** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

**Lake plain.** A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

**Landslide.** The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

**Large stones** (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

**Lateral moraine.** A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

**Leaching.** The removal of soluble material from soil or other material by percolating water.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loamy soil.** Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by the wind.

**Low-residue crops.** Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

**Low strength.** The soil is not strong enough to support loads.

**Marl.** An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

**Mean annual increment (MAI).** The average annual increase in volume of a tree during the entire life of the tree.

**Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Merchantable trees.** Trees that are of sufficient size to be economically processed into wood products.

**Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

**Microhigh.** An area that is 2 to 12 inches higher than the adjacent microlow.

**Microlow.** An area that is 2 to 12 inches lower than the adjacent microhigh.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Miscellaneous water.** A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately deep soil.** A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Moraine.** An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—

*few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

**Mountain.** A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.

**Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

**Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

**Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

**Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Observed rooting depth.** Depth to which roots have been observed to penetrate.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**Outwash plain.** An extensive area of glaciofluvial material that was deposited by meltwater streams.

**Overstory.** The trees in a forest that form the upper crown cover.

**Oxbow.** The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

**Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Percs slowly** (in tables). The slow movement of water through the soil, adversely affecting the specified use.

**Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow .....	less than 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow .....	0.2 to 0.6 inch
Moderate .....	0.6 inch to 2.0 inches
Moderately rapid .....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid .....	more than 20 inches

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Playa.** The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

**Plowpan.** A compacted layer formed in the soil directly below the plowed layer.

**Ponding.** Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

**Poor filter** (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

**Poorly graded.** Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Poor outlets** (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

**Potential native plant community.** See Climax plant community.

**Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

**Prescribed burning.** The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Proper grazing use.** Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

**Quartzite, metamorphic.** Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

**Quartzite, sedimentary.** Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

**Range condition.** The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

**Rangeland.** Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or

browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

**Range site.** An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid .....	less than 3.5
Extremely acid .....	3.5 to 4.4
Very strongly acid .....	4.5 to 5.0
Strongly acid .....	5.1 to 5.5
Moderately acid .....	5.6 to 6.0
Slightly acid .....	6.1 to 6.5
Neutral .....	6.6 to 7.3
Slightly alkaline .....	7.4 to 7.8
Moderately alkaline .....	7.9 to 8.4
Strongly alkaline .....	8.5 to 9.0
Very strongly alkaline .....	9.1 and higher

**Recessional moraine.** A moraine formed during a temporary but significant halt in the retreat of a glacier.

**Red beds.** Sedimentary strata mainly red in color and composed largely of sandstone and shale.

**Regeneration.** The new growth of a natural plant community, developing from seed.

**Regolith.** The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

**Relict stream terrace.** One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.



**Riser.** The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

**Riverwash.** Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

**Road cut.** A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rock outcrop.** Exposures of bare bedrock other than lava flows and rock-lined pits.

**Rooting depth** (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Rubble land.** Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Saline soil.** A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

**Salinity.** The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline .....	0 to 4
Slightly saline .....	4 to 8
Moderately saline .....	8 to 16
Strongly saline .....	more than 16

**Salty water** (in tables). Water that is too salty for consumption by livestock.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly

**Sandy soil.** Sand or loamy sand.

**Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

**Sawlogs.** Logs of suitable size and quality for the production of lumber.

**Scarification.** The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

**Scribner's log rule.** A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

**Sedimentary plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Sedimentary uplands.** Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

**Seepage** (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

**Semiconsolidated sedimentary beds.** Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

**Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

**Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**Shale.** Sedimentary rock formed by the hardening of a clay deposit.

**Shallow soil.** A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action



**Shelterwood system.** A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

**Shoulder.** The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

**Shrink-swell** (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silica.** A combination of silicon and oxygen. The mineral form is called quartz.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

**Sinkhole.** A depression in the landscape where limestone has been dissolved.

**Site class.** A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

**Site curve (50-year).** A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

**Site curve (100-year).** A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or

dominant and codominant trees that are 100 years old or are 100 years old at breast height.

**Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

**Skid trails.** Pathways along which logs are dragged to a common site for loading onto a logging truck.

**Slash.** The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

**Slickens.** Accumulations of fine-textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

**Slickensides.** Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

**Slick spot.** A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

**Slippage** (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level .....	0 to 2 percent
Gently sloping .....	2 to 4 percent
Moderately sloping .....	4 to 8 percent
Strongly sloping .....	8 to 15 percent
Moderately steep .....	15 to 25 percent
Steep .....	25 to 45 percent
Very steep .....	more than 45 percent

**Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

**Slow intake** (in tables). The slow movement of water into the soil.

**Slow refill** (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

**Small stones** (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Sodic (alkali) soil**. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

**Sodicity**. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of  $\text{Na}^+$  to  $\text{Ca}^{++} + \text{Mg}^{++}$ . The degrees of sodicity and their respective ratios are:

Slight .....	less than 13:1
Moderate .....	13-30:1
Strong .....	more than 30:1

**Soft bedrock**. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

**Soil**. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates**. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand .....	2.0 to 1.0
Coarse sand .....	1.0 to 0.5
Medium sand .....	0.5 to 0.25
Fine sand .....	0.25 to 0.10
Very fine sand .....	0.10 to 0.05
Silt .....	0.05 to 0.002
Clay .....	less than 0.002

**Solum**. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

**Species**. A single, distinct kind of plant or animal

**Stone line**. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

**Stones**. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

**Stony**. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Strath terrace**. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

**Stream channel**. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

**Stream terrace**. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

**Stripcropping**. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

**Structure, soil**. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch**. Stubble or other crop residue left on the soil or partly worked into the soil. It protects from soil blowing and erosion by water after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil**. Technically, the B horizon; roughly, the part of the solum below plow depth.

**Subsoiling**. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

**Substratum**. The part of the soil below the solum.

**Subsurface layer**. Technically, the E horizon.

color and lower in content of organic matter than the overlying surface layer.

**Summer fallow.** The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

**Summit.** A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**Tailwater.** The water directly downstream of a structure.

**Talus.** Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

**Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and

*clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer** (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

**Till plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

**Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Toe slope.** The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

**Too arid** (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Toxicity** (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

**Trafficability.** The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

**Tread.** The relatively flat terrace surface that was cut or built by stream or wave action.

**Tuff.** A compacted deposit that is 50 percent or more volcanic ash and dust.

**Understory.** Any plants in a forest community that grow to a height of less than 5 feet.

**Unstable fill** (in tables). Risk of caving or sloughing on banks of fill material.

**Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Valley.** An elongated depressional area primarily developed by stream action.

**Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

**Variegation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

**Varve.** A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within

a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

**Very deep soil.** A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Very shallow soil.** A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

**Water bars.** Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

**Waterspreading.** Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**Windthrow.** The action of uprooting and tipping over trees by the wind.

# Accessibility Statement

---

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at [ServiceDesk-FTC@ftc.usda.gov](mailto:ServiceDesk-FTC@ftc.usda.gov). For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

The USDA Target Center can convert USDA information and documents into alternative formats, including Braille, large print, video description, diskette, and audiotape. For more information, visit the TARGET Center's Web site (<http://www.targetcenter.dm.usda.gov/>) or call (202) 720-2600 (Voice/TTY).

## **Nondiscrimination Policy**

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

## **To File an Employment Complaint**

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (<http://directives.sc.egov.usda.gov/33081.wba>) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at [http://www.ascr.usda.gov/complaint\\_filing\\_file.html](http://www.ascr.usda.gov/complaint_filing_file.html).

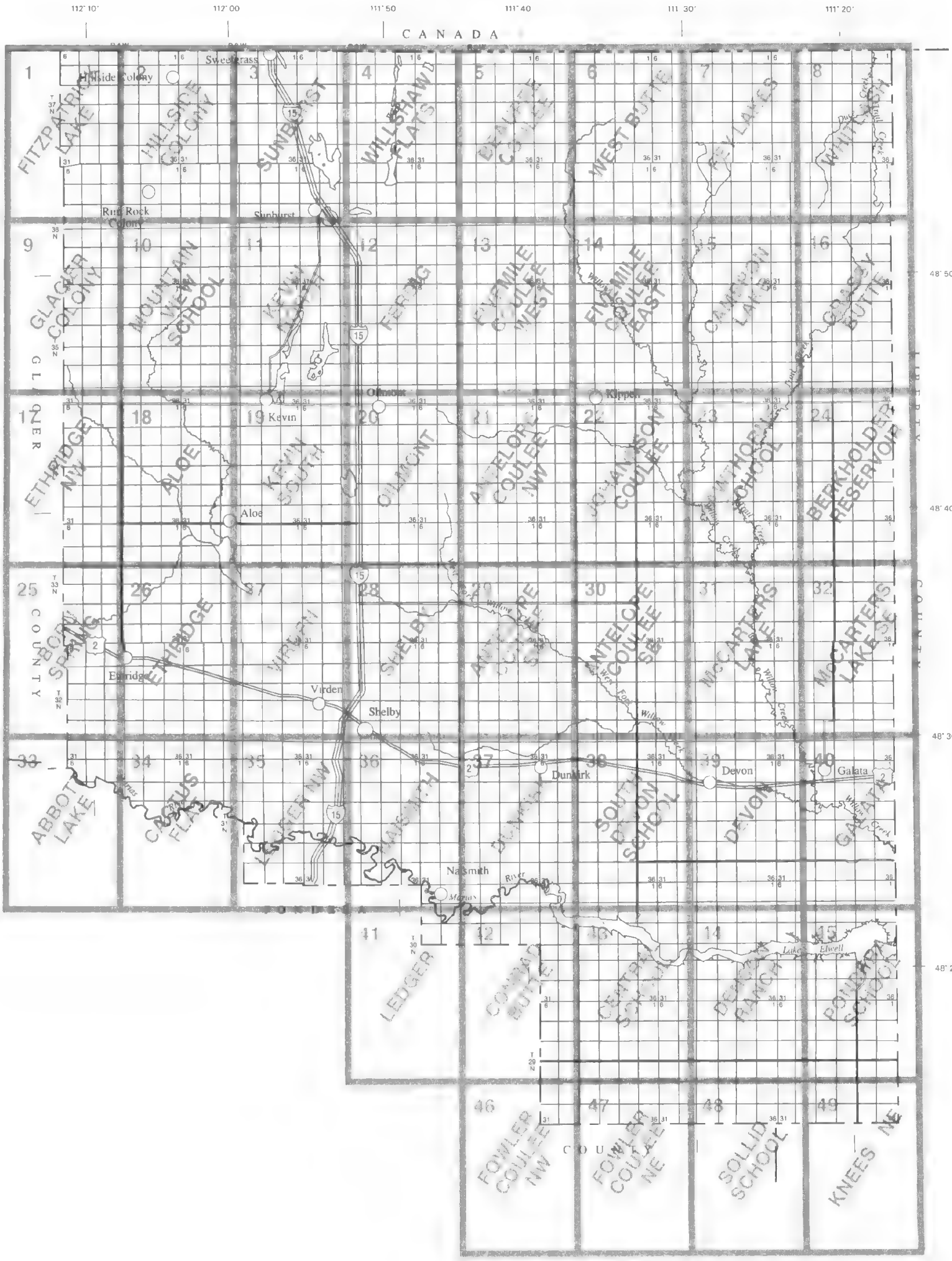
## **To File a Program Complaint**

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at [http://www.ascr.usda.gov/complaint\\_filing\\_cust.html](http://www.ascr.usda.gov/complaint_filing_cust.html) or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to [program.intake@usda.gov](mailto:program.intake@usda.gov).

## **Persons with Disabilities**

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).



SECTIONALIZED  
TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

## INDEX TO MAP SHEETS TOOLE COUNTY, MONTANA

Scale 1:380160

1 0 1 2 3

MILES

1 0 1 2 3 4 5 6

KILOMETERS

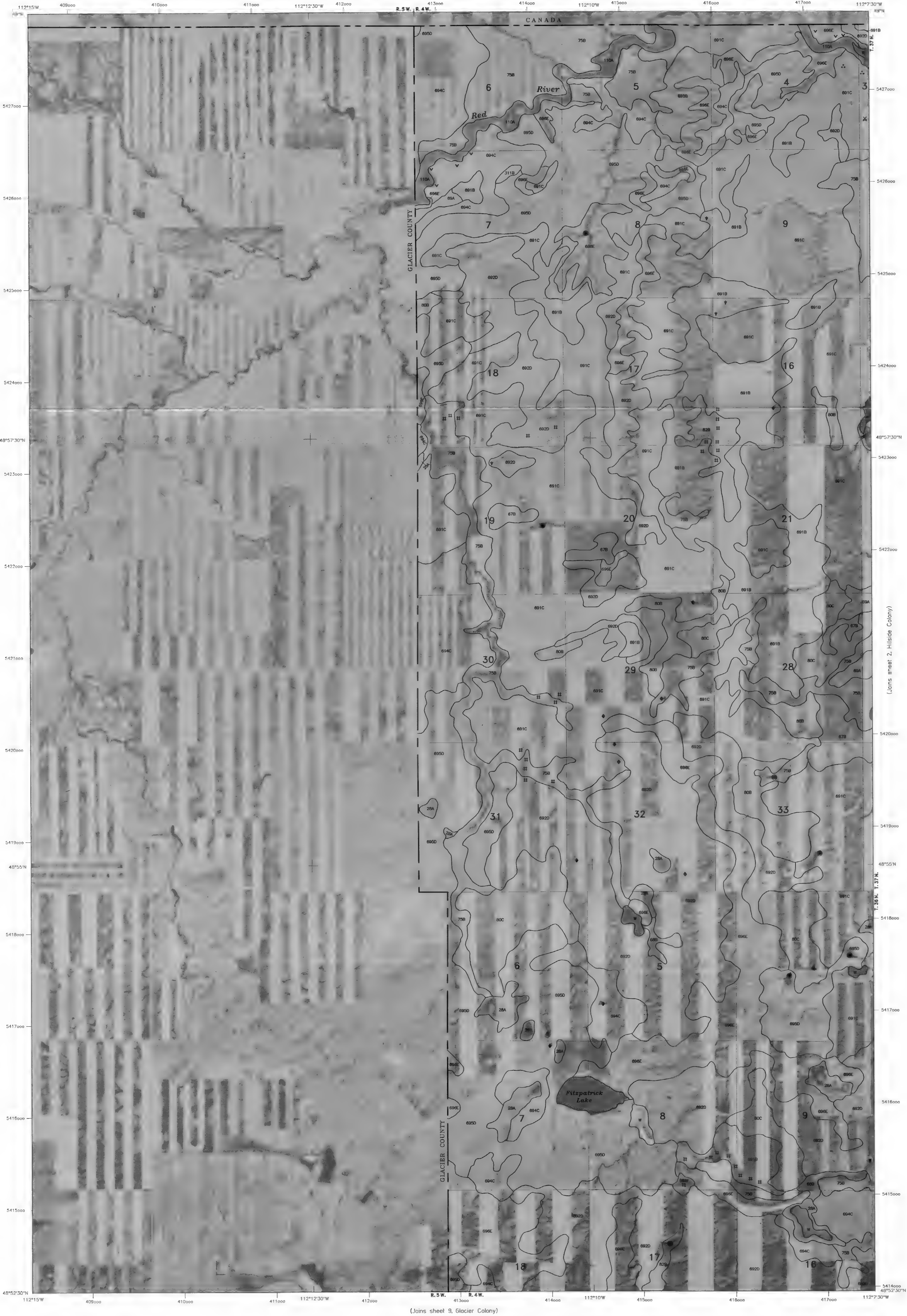


SOIL LEGEND

SYMBOL	NAME	SYMBOL	NAME
2A	Riverwash	96D	Macar loam, 8 to 15 percent slopes
4B	Brockway silt loam, 2 to 4 percent slopes	98B	Kremlin loam, 0 to 4 percent slopes
4C	Brockway silt loam, 4 to 8 percent slopes	101A	Hanly-Glendive-Havre complex, 0 to 2 percent slopes
12C	Tally sandy loam, 2 to 8 percent slopes	110A	Korchea-Kiwanis complex, 0 to 2 percent slopes
12D	Tally sandy loam, 8 to 15 percent slopes	141A	McKenzie clay, saline, 0 to 2 percent slopes
13B	Tanna clay loam, 0 to 4 percent slopes	143A	Meadowcreek loam, 0 to 2 percent slopes
13C	Tanna clay loam, 4 to 8 percent slopes	144A	Bigsandy silty clay loam, 0 to 1 percent slopes
14A	McKenzie silty clay, 0 to 1 percent slopes	162B	Degrad sandy loam, 0 to 4 percent slopes
15F	Lambeth silt loam, 15 to 70 percent slopes	171F	Delpoint-Cabbart clay loams, 25 to 60 percent slopes
16B	Degrad loam, 0 to 4 percent slopes	181D	Doney-Cabba complex, 4 to 15 percent slopes
19B	Kenilworth loam, 0 to 4 percent slopes	191B	Kenilworth fine sandy loam, 0 to 4 percent slopes
20C	Cabba loam, 4 to 8 percent slopes	200F	Badland
20D	Cabba loam, 8 to 15 percent slopes	201F	Cabba-Rock outcrop complex, 25 to 70 percent slopes
22E	Hillon clay loam, 8 to 25 percent slopes	202F	Cabba-Dast fine sandy loams, 25 to 45 percent slopes
22F	Hillon clay loam, 25 to 60 percent slopes	203E	Cabba-Doney clay loams, 8 to 25 percent slopes
23A	Acel silty clay loam, 0 to 2 percent slopes	211F	Cabbart-Rock outcrop complex, 25 to 70 percent slopes
26B	Absher clay, 0 to 4 percent slopes	212F	Cabbart-Hillon complex, 25 to 45 percent slopes
27B	Attewan loam, 0 to 4 percent slopes	213E	Cabbart-Delpoint loams, 8 to 25 percent slopes
28A	Nishon clay loam, 0 to 1 percent slopes	221E	Hillon-Kevin clay loams, 15 to 25 percent slopes
29B	Nunemaker silty clay loam, 0 to 4 percent slopes	222E	Hillon-Neldore complex, 8 to 25 percent slopes
29C	Nunemaker silty clay loam, 4 to 8 percent slopes	222F	Hillon-Neldore complex, 25 to 70 percent slopes
30B	Marvan silty clay, 0 to 4 percent slopes	224E	Hillon-Joplin loams, 8 to 25 percent slopes
30C	Marvan silty clay, 4 to 8 percent slopes	241C	Marmarth-Evanston loams, 0 to 8 percent slopes
32B	Kobase silty clay loam, 0 to 4 percent slopes	251C	Bascovy clay loam, 2 to 8 percent slopes
32C	Kobase silty clay loam, 4 to 8 percent slopes	252D	Bascovy-Neldore clays, 8 to 15 percent slopes
33B	Phillips clay loam, 0 to 4 percent slopes	261A	Absher-Nobe complex, 0 to 2 percent slopes
35B	Assinniboine fine sandy loam, 0 to 4 percent slopes	272B	Attewan sandy loam, 0 to 4 percent slopes
35C	Assinniboine fine sandy loam, 4 to 8 percent slopes	300F	Rubble land
36C	Chinook loam, 0 to 8 percent slopes	311B	Creed-Gerdrum-Absher complex, 0 to 4 percent slopes
37B	Evanston clay loam, 0 to 4 percent slopes	321B	Kobase silty clay loam, calcareous, 0 to 4 percent slopes
37C	Evanston clay loam, 4 to 8 percent slopes	321C	Kobase silty clay loam, calcareous, 4 to 8 percent slopes
38B	Ethridge clay loam, 0 to 4 percent slopes	323C	Sagedale silty clay loam, 2 to 8 percent slopes
39B	Ferd loam, 0 to 4 percent slopes	331B	Phillips-Elloam clay loams, 0 to 4 percent slopes
42B	Joplin clay loam, 0 to 4 percent slopes	332B	Phillips-Kevin clay loams, 0 to 4 percent slopes
42C	Joplin clay loam, 4 to 8 percent slopes	364C	Chinook fine sandy loam, 0 to 8 percent slopes
44B	Kevin clay loam, 0 to 4 percent slopes	372B	Evanston fine sandy loam, 0 to 4 percent slopes
44C	Kevin clay loam, 4 to 8 percent slopes	373C	Evanston-Tinsley complex, 2 to 8 percent slopes
45C	Cozberg fine sandy loam, 2 to 8 percent slopes	374B	Evanston loam, 0 to 4 percent slopes
45D	Cozberg fine sandy loam, 8 to 15 percent slopes	374C	Evanston loam, 4 to 8 percent slopes
47B	Marias silty clay, 0 to 4 percent slopes	378B	Evanston complex, 0 to 4 percent slopes
48B	Vanda silty clay, 0 to 4 percent slopes	379C	Evanston-Busby complex, 2 to 8 percent slopes
48C	Vanda silty clay, 4 to 8 percent slopes	384B	Ethridge silty clay loam, 0 to 4 percent slopes
49C	Floweree silt loam, 2 to 8 percent slopes	386B	Ethridge-Evanston clay loams, 0 to 4 percent slopes
50B	Telstad clay loam, 0 to 4 percent slopes	391B	Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes
51B	Turner loam, 0 to 4 percent slopes	391C	Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes
53D	Sunburst clay loam, 8 to 15 percent slopes	402A	Gerdrum-Absher complex, 0 to 2 percent slopes
53E	Sunburst clay loam, 15 to 25 percent slopes	411B	Reeder Cabba complex, 0 to 4 percent slopes
53F	Sunburst clay loam, 25 to 70 percent slopes	411C	Reeder-Cabba complex, 4 to 8 percent slopes
54B	Trudau loam, 0 to 4 percent slopes	421C	Joplin-Hillon clay loams, 2 to 8 percent slopes
58B	Lonna silt loam, 0 to 4 percent slopes	421D	Joplin-Hillon clay loams, 8 to 15 percent slopes
59B	Hedstrom fine sandy loam, 0 to 4 percent slopes	423B	Joplin Hillon clay loams, 0 to 3 percent slopes
60A	Havre silty clay loam, 0 to 2 percent slopes	423C	Hillon-Joplin clay loams, 3 to 8 percent slopes
62A	Vaeda silty clay loam, 0 to 2 percent slopes	424C	Joplin-Hillon gravelly loams, 3 to 8 percent slopes
64B	Nobe clay, 0 to 4 percent slopes	425C	Joplin-Telstad clay loams, 2 to 8 percent slopes
67B	Bearpaw clay loam, 0 to 4 percent slopes	426B	Joplin loam, 0 to 4 percent slopes
68B	Gerber clay, 0 to 4 percent slopes	427B	Joplin complex, 0 to 4 percent slopes
69A	Vida clay loam, 0 to 2 percent slopes	427C	Joplin complex, 4 to 8 percent slopes
69C	Vida clay loam, 2 to 8 percent slopes	441C	Kevin-Hillon clay loams, 2 to 8 percent slopes
71F	Roy gravelly clay loam, 25 to 60 percent slopes	443B	Kevin-Ferd complex, 0 to 4 percent slopes
72F	Zahill loam, 25 to 45 percent slopes	444B	Kevin, calcareous-Ferd complex, 0 to 4 percent slopes
73D	Yetull loamy fine sand, 0 to 15 percent slopes	445B	Kevin complex, 0 to 4 percent slopes
74B	Shambo loam, 0 to 4 percent slopes	445C	Kevin complex, 4 to 8 percent slopes
75B	Farnuf clay loam, 0 to 3 percent slopes	446C	Kevin-Elloam clay loams, 2 to 8 percent slopes
75C	Farnuf clay loam, 3 to 8 percent slopes	451A	Cozberg Lihen fine sandy loams, 0 to 2 percent slopes
77C	Tinsley gravelly sandy loam, 2 to 8 percent slopes	451C	Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes
77E	Tinsley gravelly sandy loam, 8 to 25 percent slopes	481A	Bigsag silty clay, 0 to 2 percent slopes
79B	Yamacall loam, 0 to 4 percent slopes	482A	Vanda-Marvan, saline, clays, 0 to 2 percent slopes
79C	Yamacall loam, 4 to 8 percent slopes	503B	Telstad Joplin clay loams, 0 to 4 percent slopes
79D	Yamacall loam, 8 to 15 percent slopes	503C	Telstad-Joplin clay loams, 4 to 8 percent slopes
80B	Williams clay loam, 0 to 3 percent slopes	504B	Telstad-Joplin loams, 0 to 4 percent slopes
80C	Williams clay loam, 3 to 8 percent slopes	504C	Telstad-Joplin loams, 4 to 8 percent slopes
82B	Savage silty clay loam, 0 to 3 percent slopes	511C	Turner sandy loam, 2 to 6 percent slopes
85B	Benz clay loam, 0 to 4 percent slopes	521B	Elloam-Absher clay loams, 0 to 4 percent slopes
88C	Perma gravelly loam, 2 to 8 percent slopes	551E	Lihen-Blanchard loamy sands, 8 to 25 percent slopes
88E	Perma gravelly loam, 8 to 25 percent slopes	561B	Scobey-Kevin clay loams, 0 to 4 percent slopes
90A	Harlake silty clay loam, 0 to 2 percent slopes	561C	Scobey-Kevin clay loams, 4 to 8 percent slopes
94C	Busby fine sandy loam, 2 to 8 percent slopes	561D	Scobey-Kevin clay loams, 8 to 15 percent slopes
94D	Busby fine sandy loam, 8 to 15 percent slopes	563B	Scobey clay loam, 0 to 4 percent slopes
96C	Macar loam, 4 to 8 percent slopes	571A	Ryell-Rivra complex, 0 to 2 percent slopes

CONVENTIONAL AND SPECIAL  
SYMBOLS LEGEND

CULTURAL FEATURES		SPECIAL SYMBOLS FOR SOIL SURVEY	
BOUNDARIES		SOIL DELINEATIONS AND SYMBOLS	
National, state, or province	———— — —	ESCARPMENTS	
County or parish	———— — —	Other than bedrock	
UTM COORDINATE TICK	———— ————	SHORT STEEP SLOPE	.....
GEOGRAPHIC COORDINATE LINE PLSS	+	DEPRESSION, closed	◆
ROAD EMBLEM & DESIGNATIONS		MISCELLANEOUS	
Interstate		Blowout	∪
Federal		Clay spot	⊗
		Gravelly spot	∘ ∘
PITS		Rock outcrop (includes sandstone and shale)	∨
Gravel pit		Saline spot	+
Mine or quarry		Sandy spot	∴
WATER FEATURES		Sodic spot	⊘
SMALL LAKES, PONDS AND RESERVOIRS		Spoil area	≡
Perennial water		Stony spot	0
Intermittent water		Very stony spot	∞
MISCELLANEOUS WATER FEATURES		Seep area	≡
Marsh or swamp			
Wet spot			



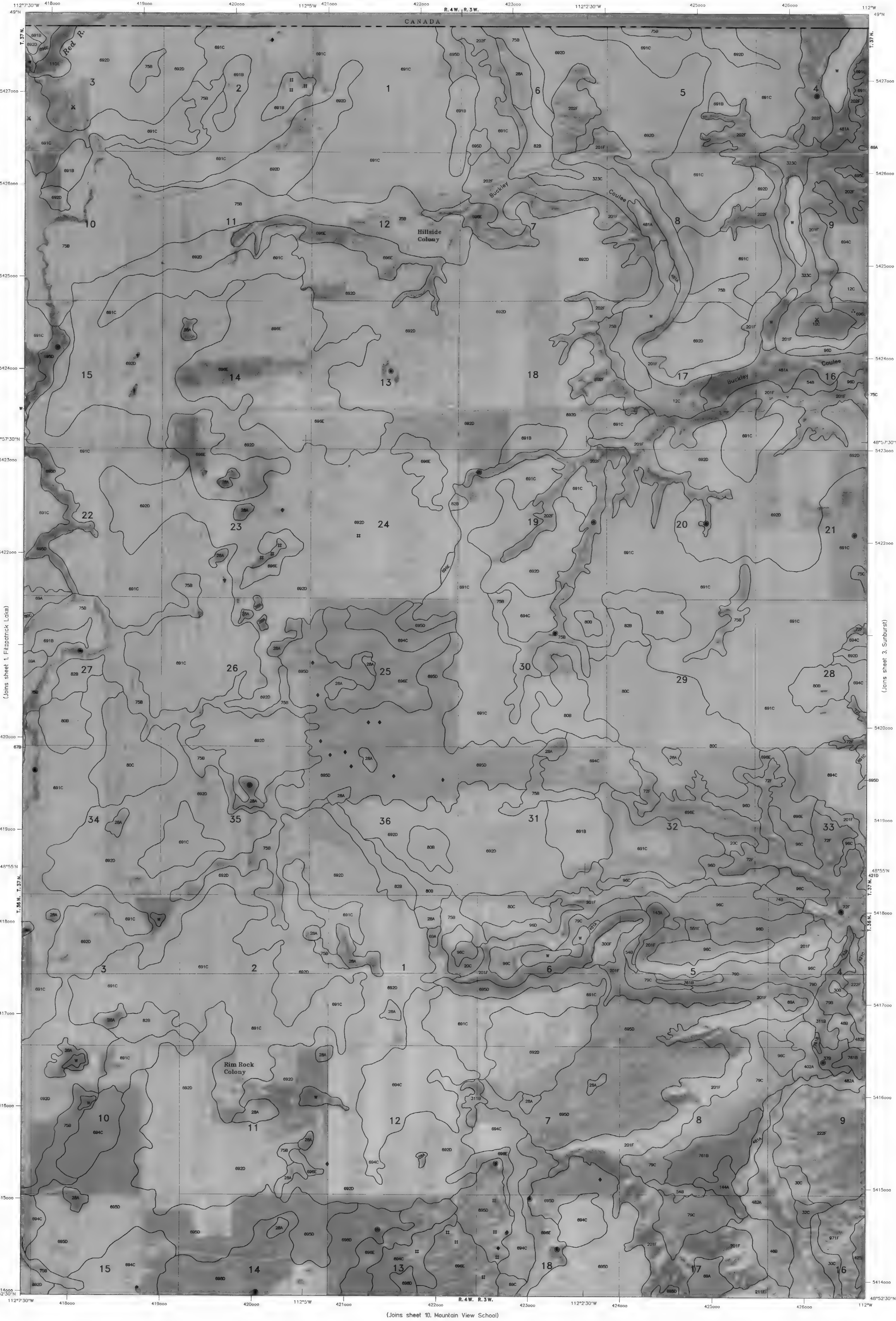
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 1

SHEET NUMBER 1 OF 49  
TOOLE COUNTY, MONTANA  
FITZPATRICK LAKE QUADRANGLE





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

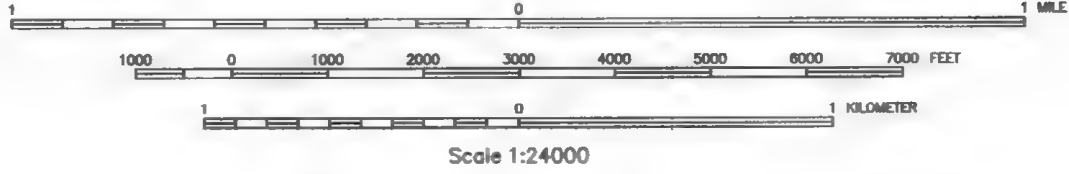
TOOLE COUNTY, MONTANA NO. 2

SHEET NUMBER 2 OF 49  
TOOLE COUNTY, MONTANA  
HILLSIDE COLONY QUADRANGLE





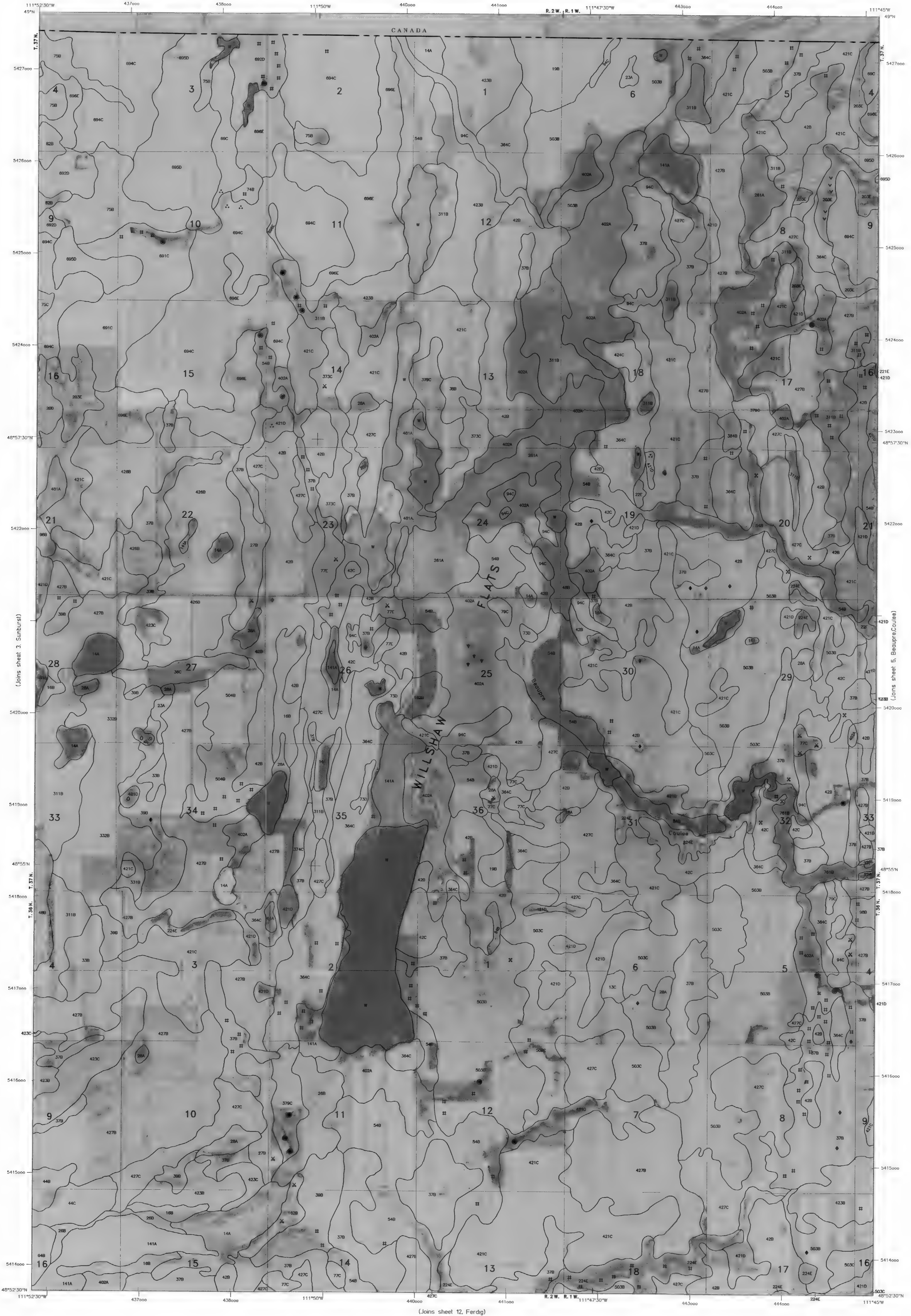
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



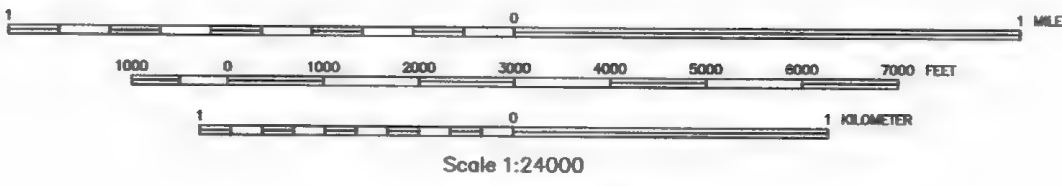
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum





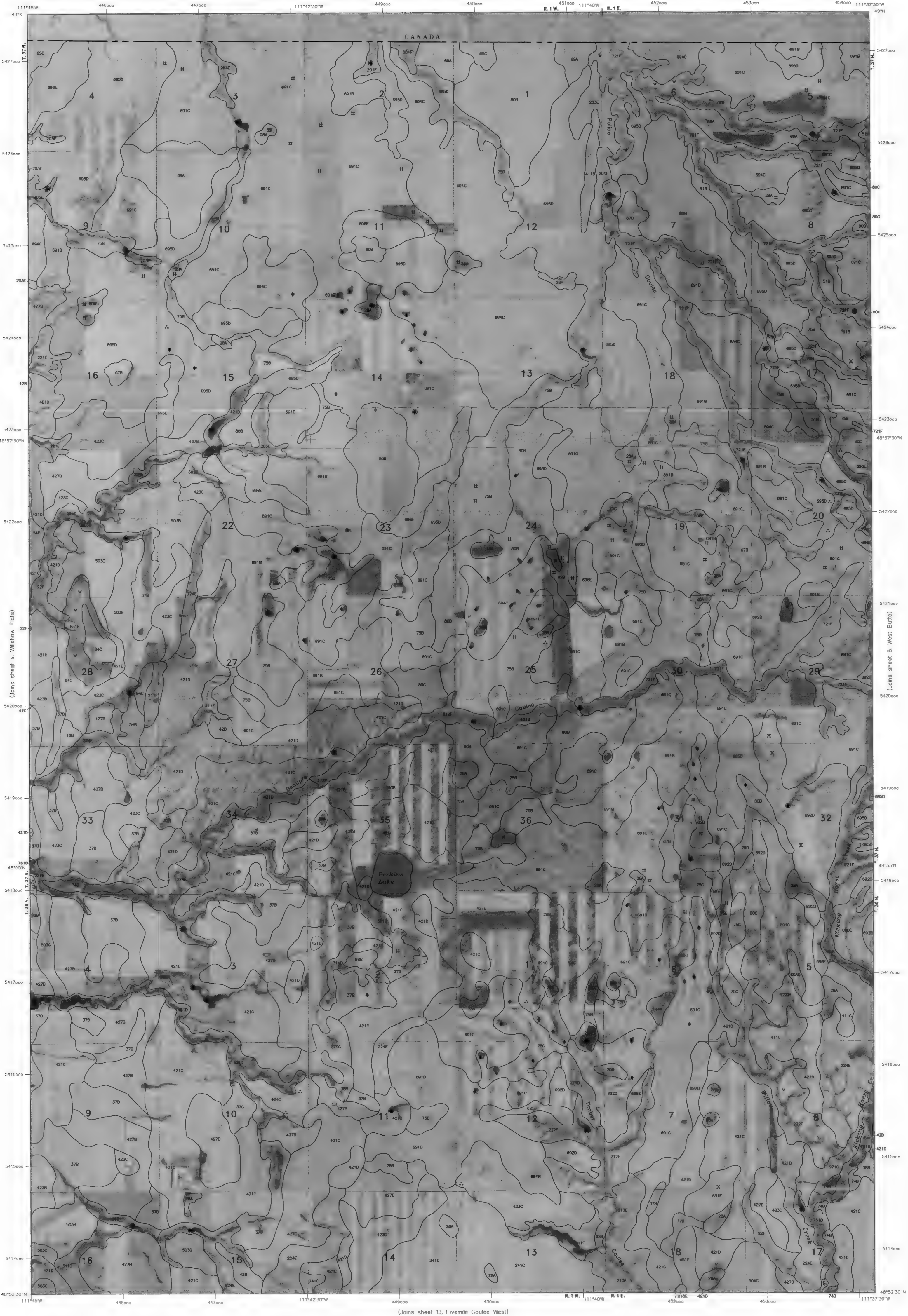


This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



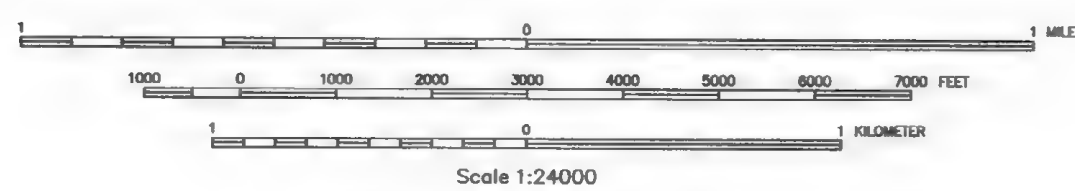
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum







TOOLE COUNTY, MONTANA  
WEST BUTTE QUADRANGLE  
SHEET NUMBER 6  
7.5 MINUTE SERIES

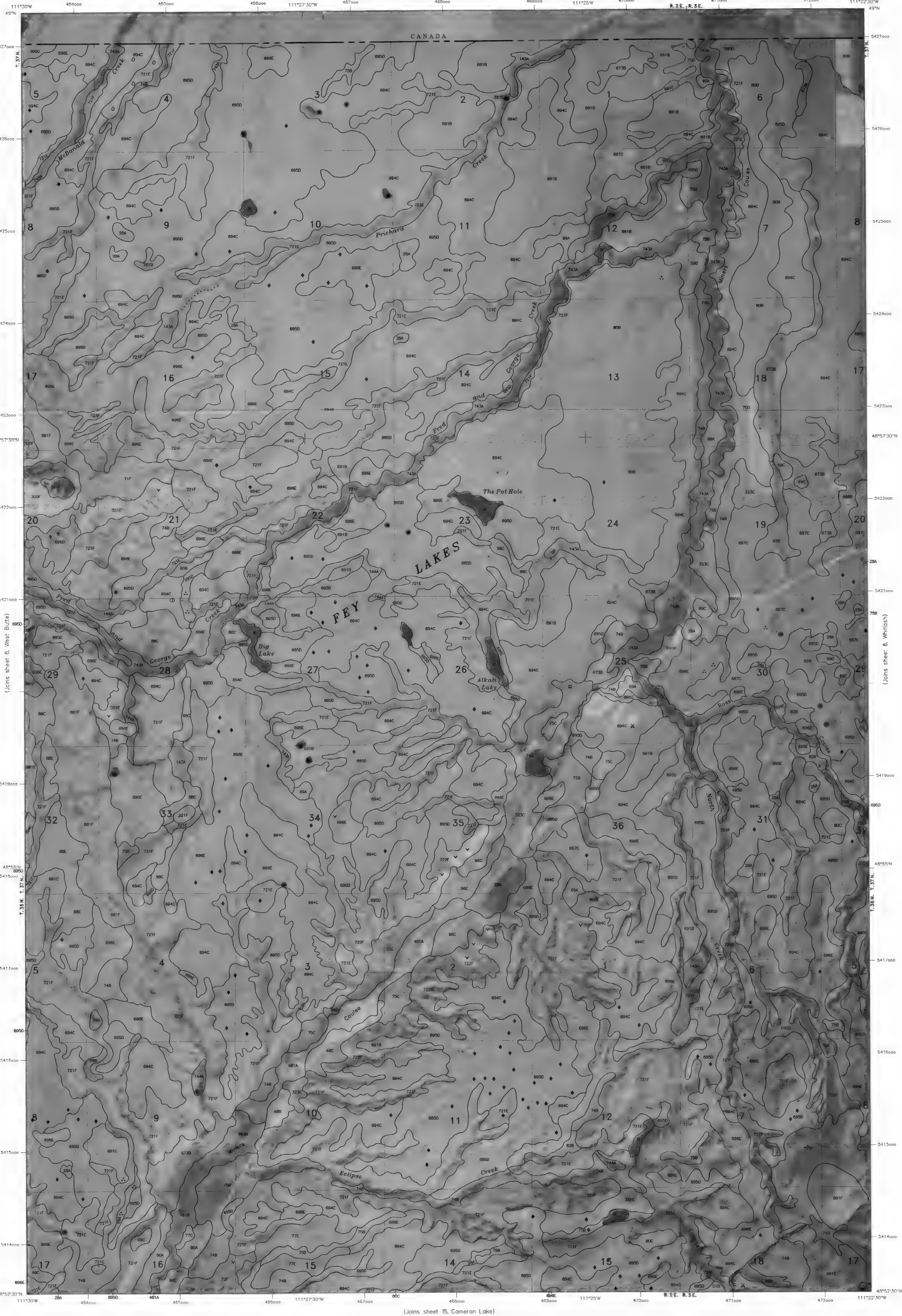


Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 6

SHEET NUMBER 6 OF 49  
TOOLE COUNTY, MONTANA  
WEST BUTTE QUADRANGLE





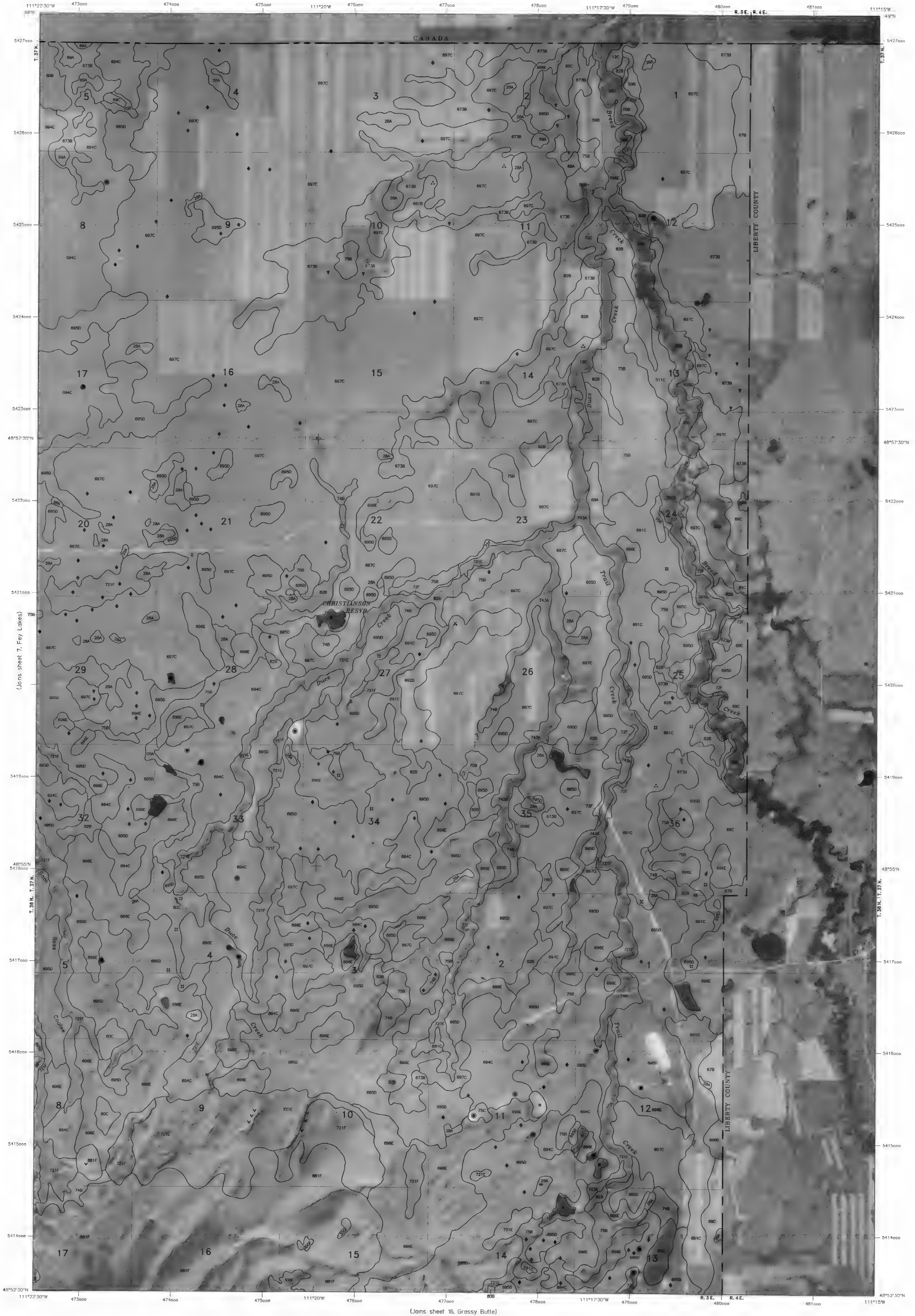
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 7

SHEET NUMBER 7 OF 49  
TOOLE COUNTY, MONTANA  
FEY LAKES QUADRANGLE





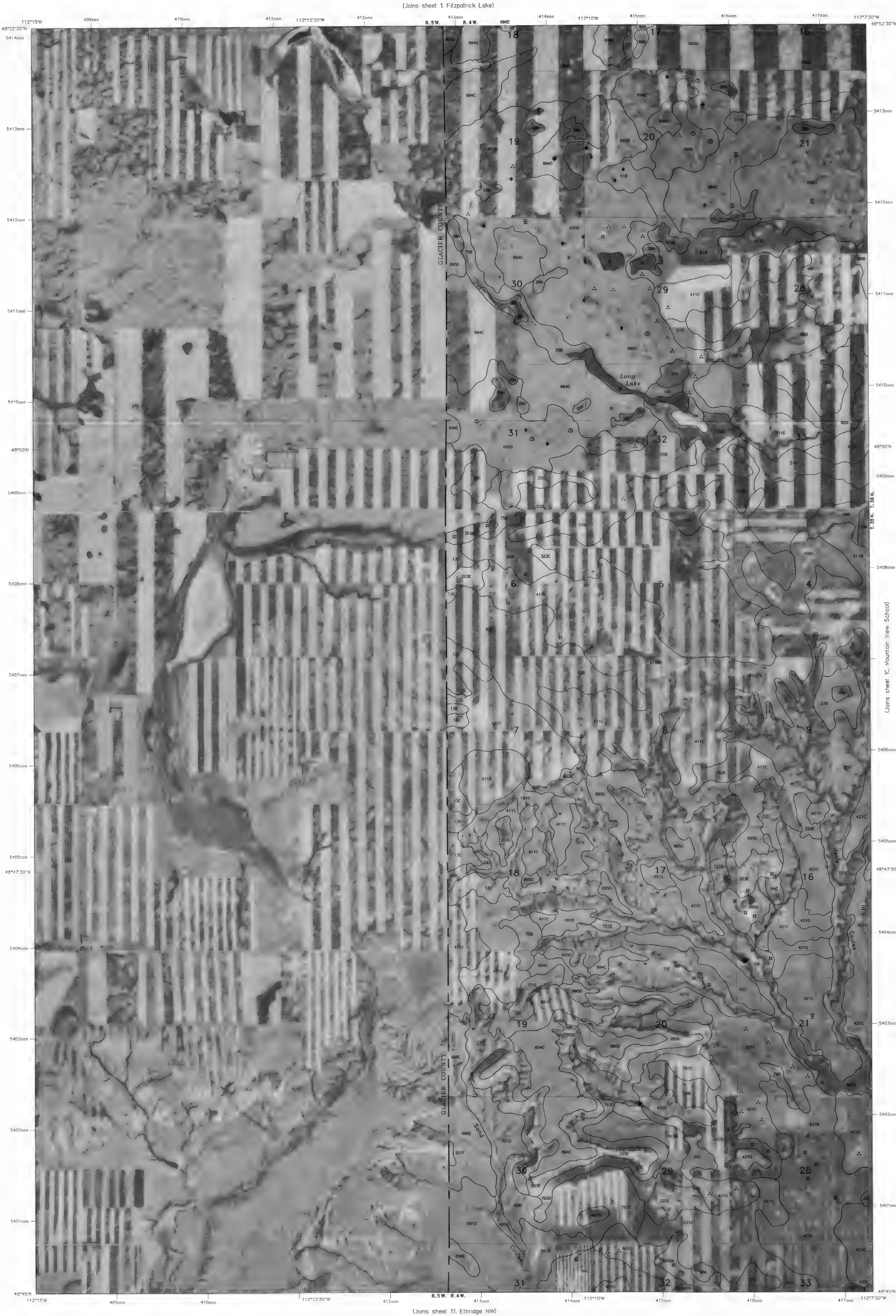
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 8

SHEET NUMBER 8 OF 49  
TOOLE COUNTY, MONTANA  
WHITLASH QUADRANGLE



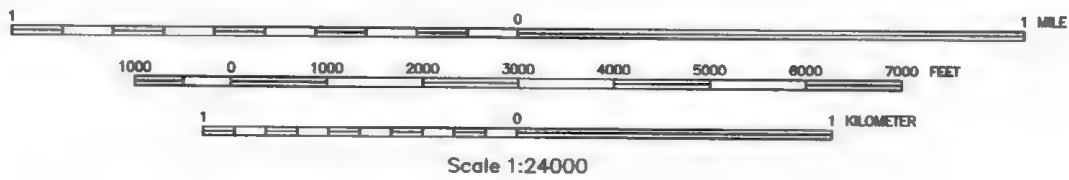


This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976–1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



TOOLE COUNTY, MONTANA  
MOUNTAIN VIEW SCHOOL QUADRANGLE  
SHEET NUMBER 10  
7.5 MINUTE SERIES

(Joins sheet 2, Hillside Colony)



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

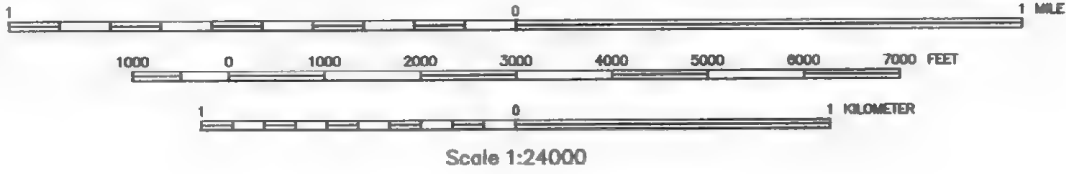
TOOLE COUNTY, MONTANA NO. 10



(Joins sheet 3. Sunburst)



(Joins sheet 19. Kevin South)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976–1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

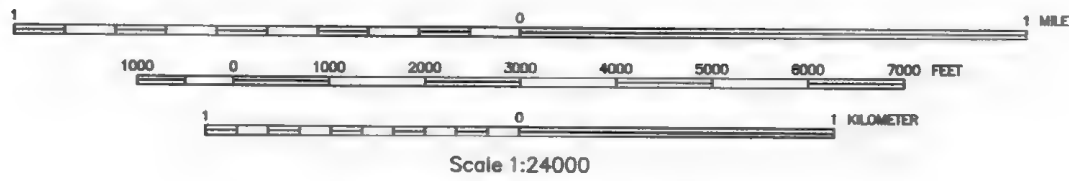
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum



(Joins sheet 4, Willshaw Flats)



(Joins sheet 20, Ollmont)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

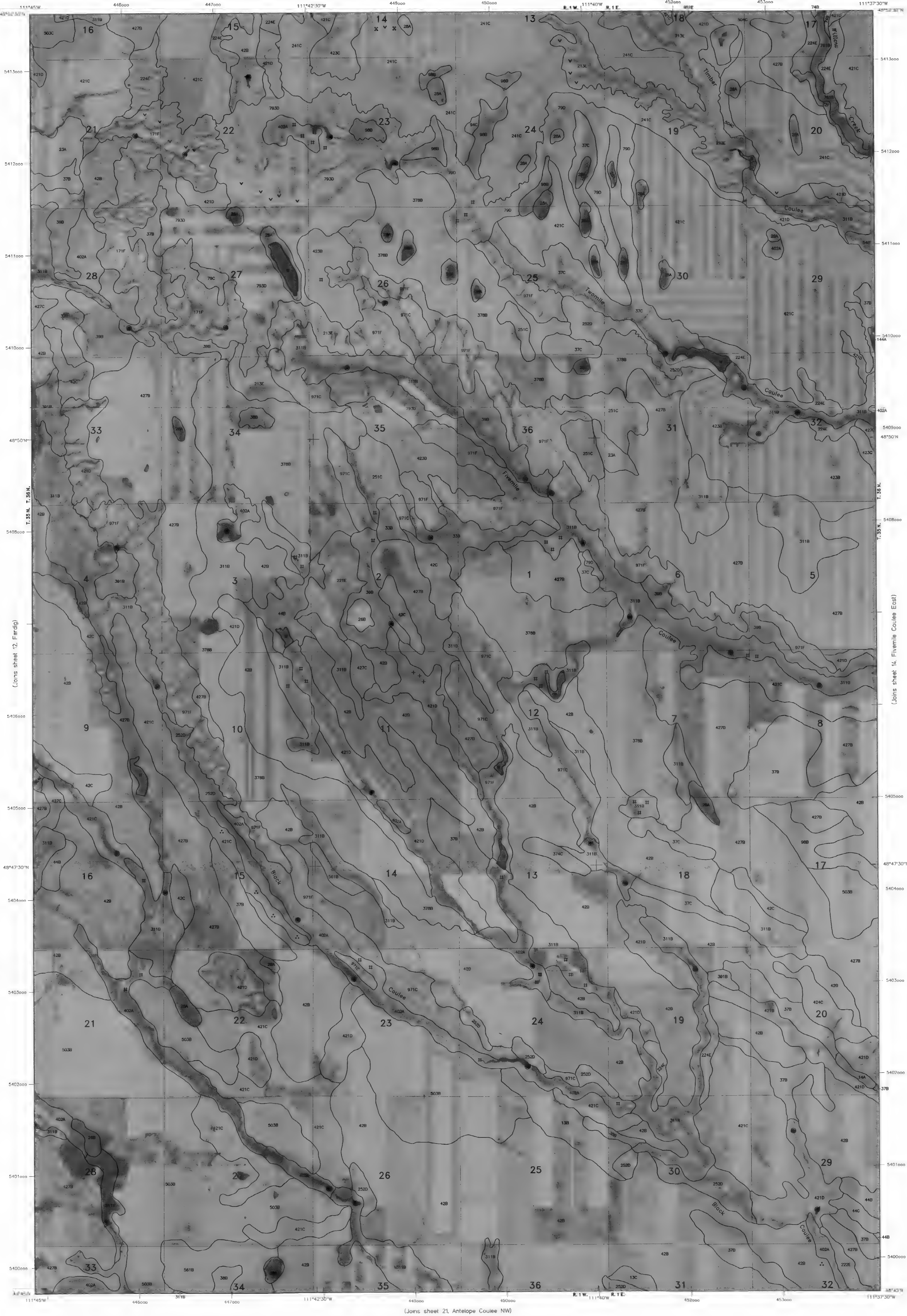
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 12

SHEET NUMBER 12 OF 49  
TOOLE COUNTY, MONTANA  
FERDIG QUADRANGLE



(Joins sheet 5, Beupre Coulee)



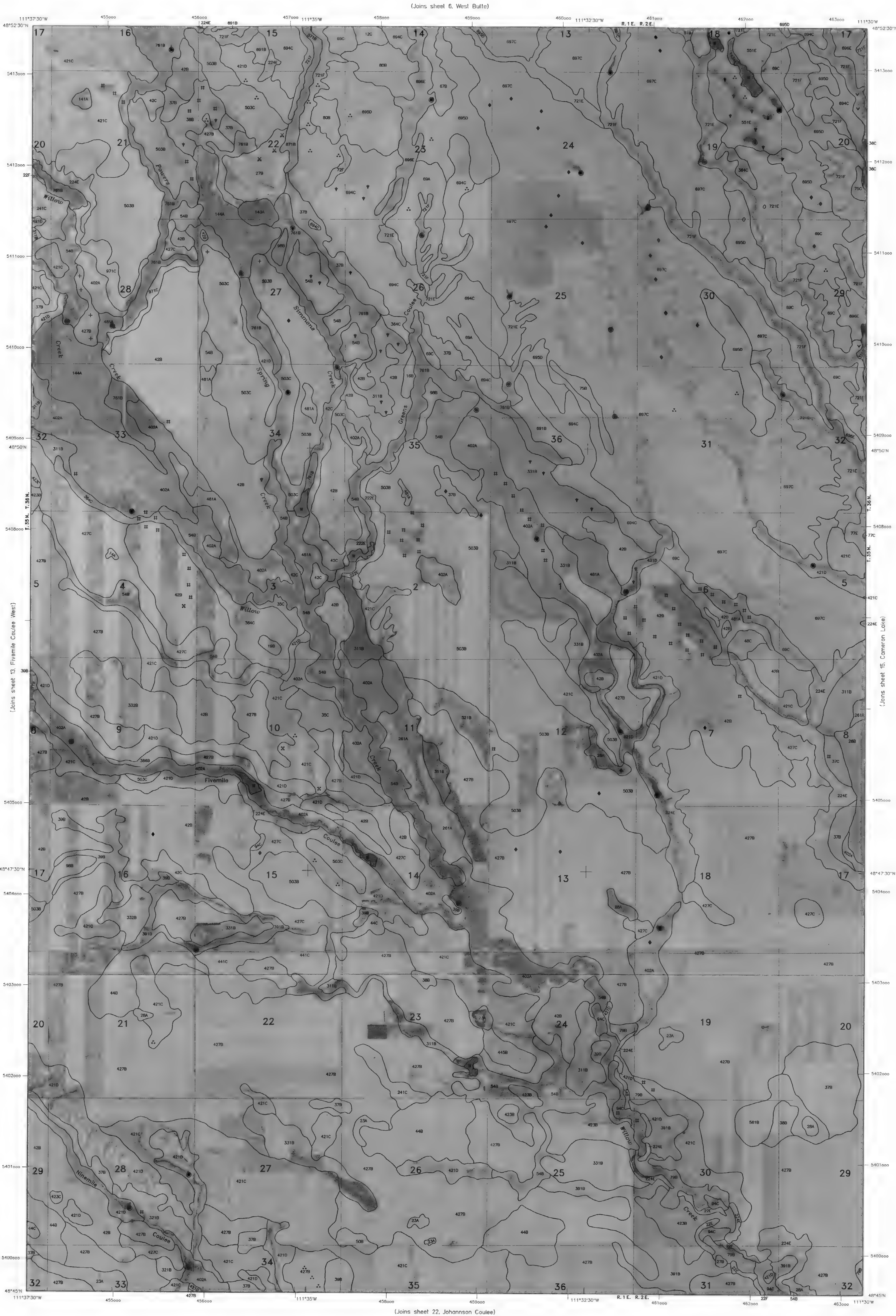
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

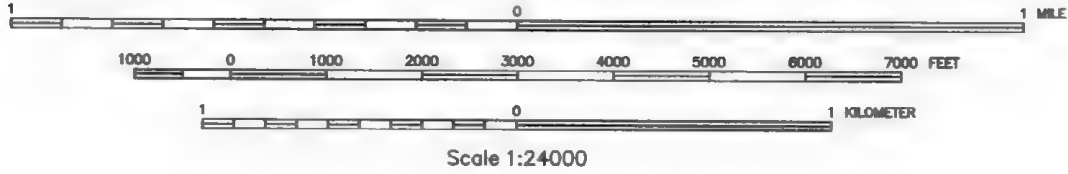
TOOLE COUNTY, MONTANA NO. 13

SHEET NUMBER 13 OF 49  
TOOLE COUNTY, MONTANA  
FIVEMILE COULEE WEST QUADRANGLE





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

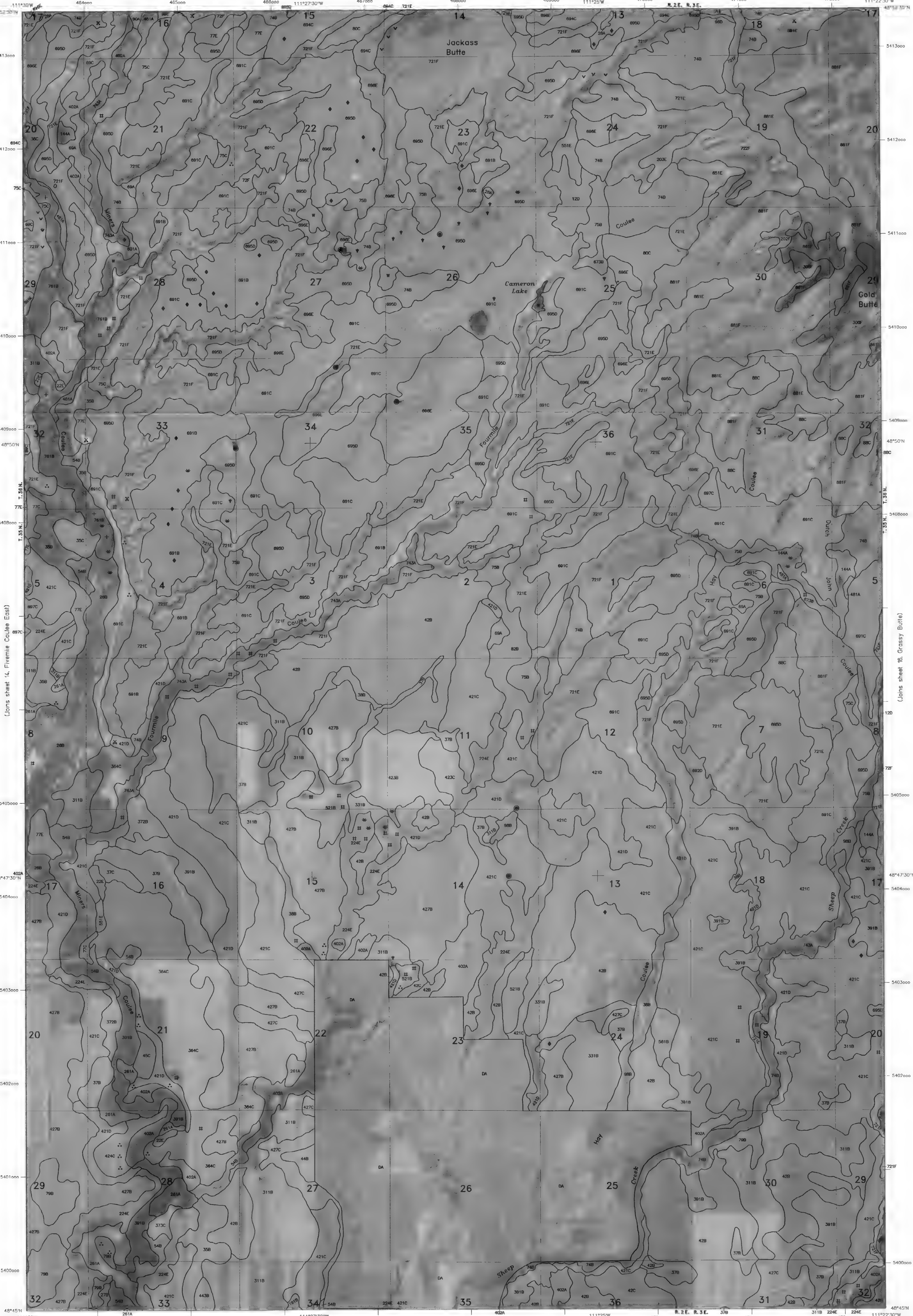
TOOLE COUNTY, MONTANA NO. 14



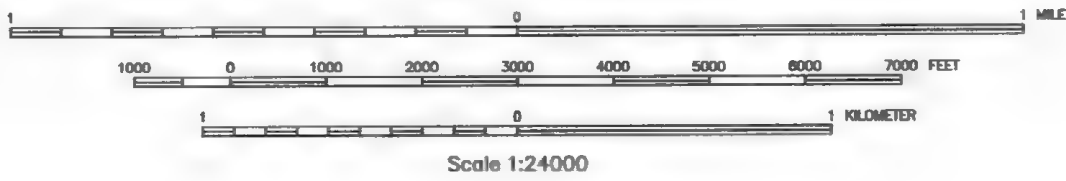
SHEET NUMBER 14 OF 49  
TOOLE COUNTY, MONTANA  
FIVEMILE COULEE EAST QUADRANGLE



(Joins sheet 7, Fey Lakes)



(Joins sheet 23, Hawthorne School)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 15

SHEET NUMBER 15 OF 49  
TOOLE COUNTY, MONTANA  
CAMERON LAKE QUADRANGLE



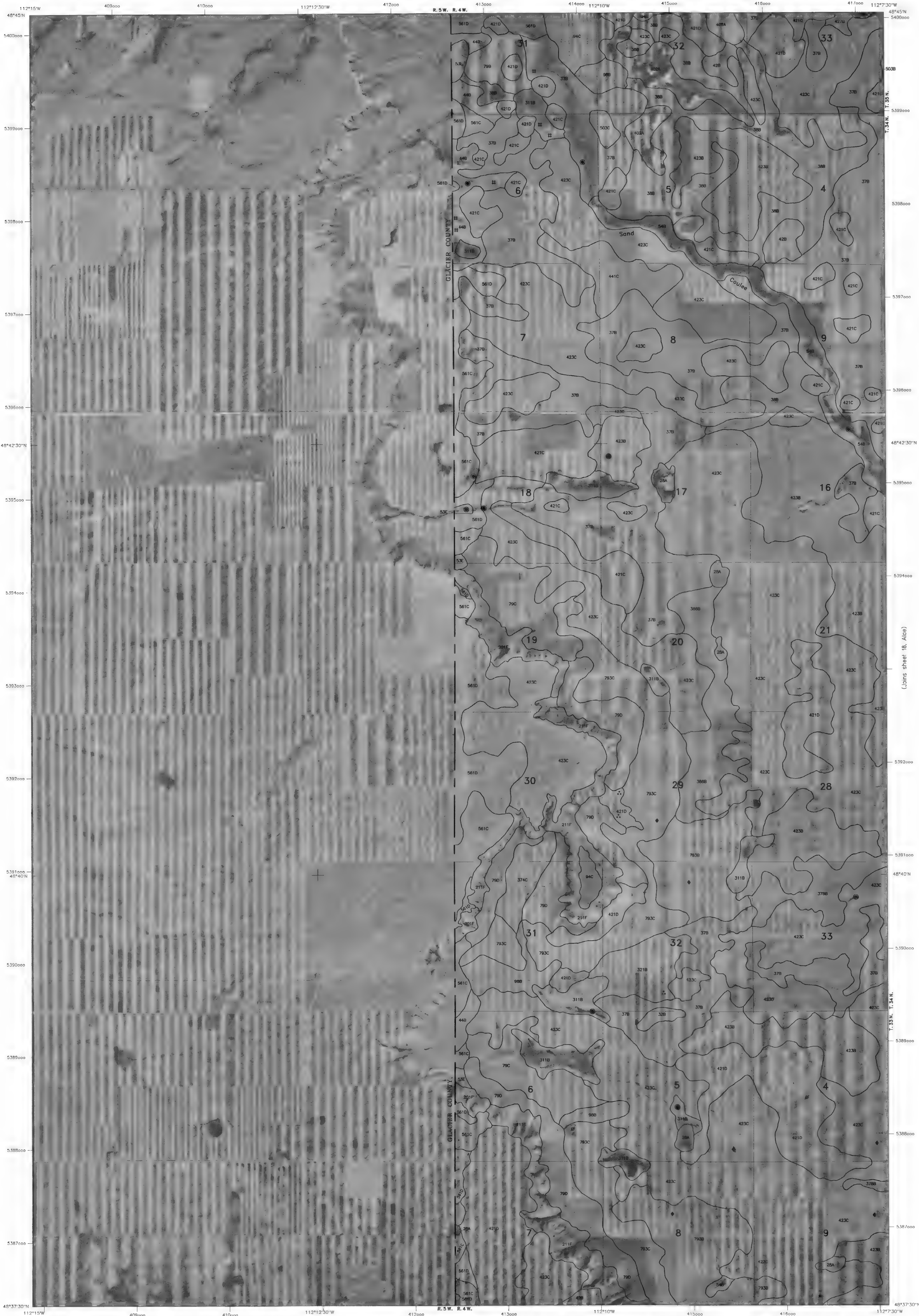


This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



TOOLE COUNTY, MONTANA  
ETHRIDGE NW QUADRANGLE  
SHEET NUMBER 17  
7.5 MINUTE SERIES

(Joins sheet 9, Glacier Colony)



1 MILE

0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

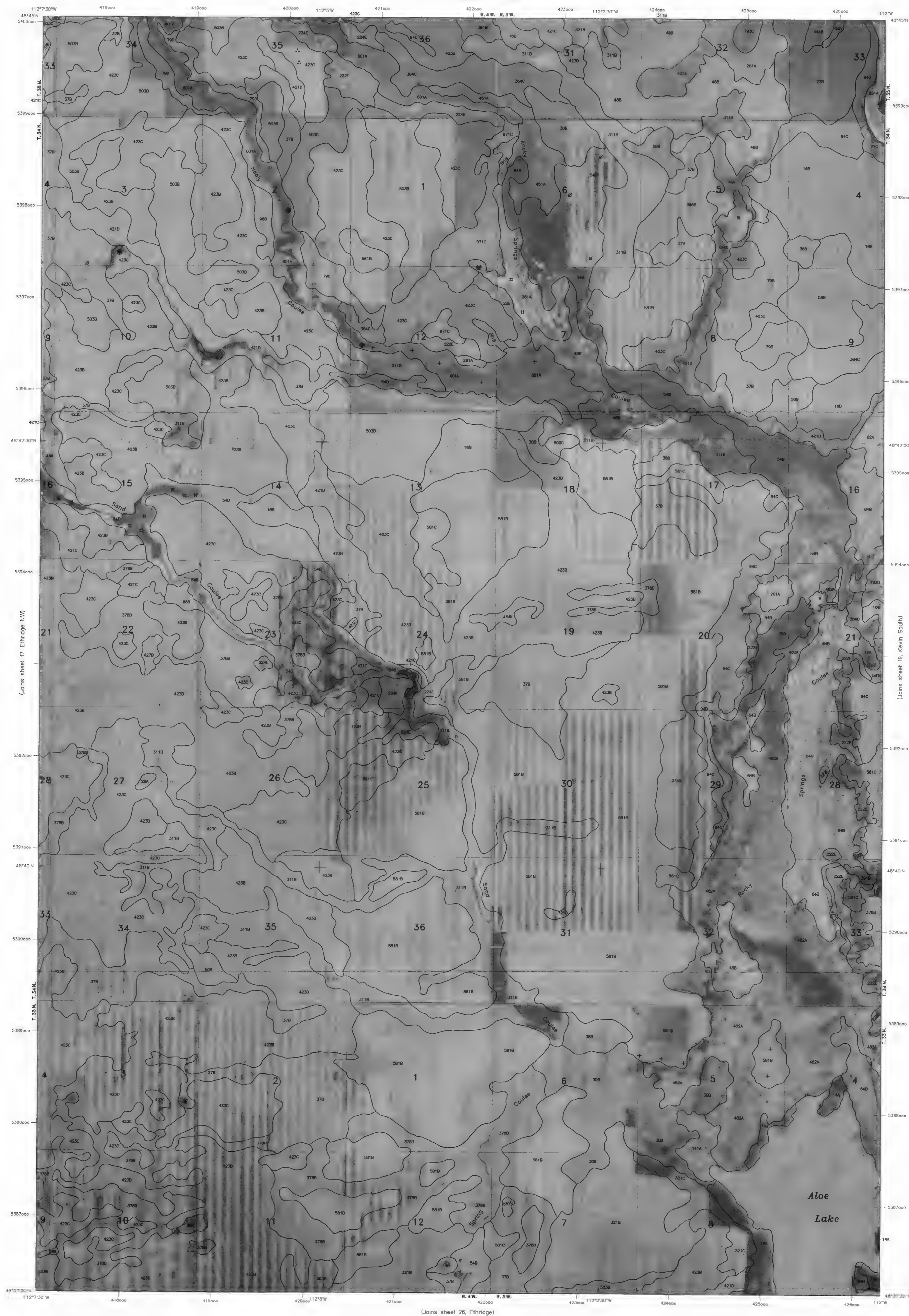
TOOLE COUNTY, MONTANA NO. 17

SHEET NUMBER 17 OF 49  
TOOLE COUNTY, MONTANA  
ETHRIDGE NW QUADRANGLE



TOOLE COUNTY, MONTANA  
ALOE QUADRANGLE  
SHEET NUMBER 18  
7.5 MINUTE SERIES

(Joins sheet 10, Mountain View School)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976–1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

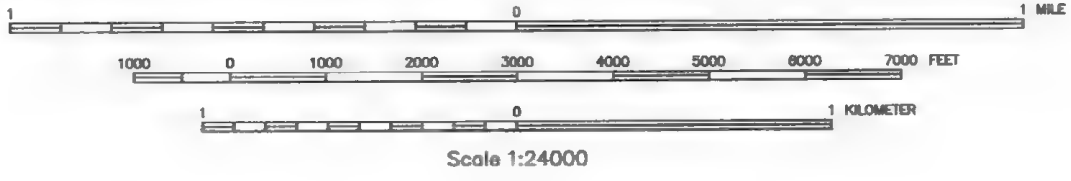
TOOLE COUNTY, MONTANA NO. 18

SHEET NUMBER 18 OF 49  
TOOLE COUNTY, MONTANA  
ALOE QUADRANGLE



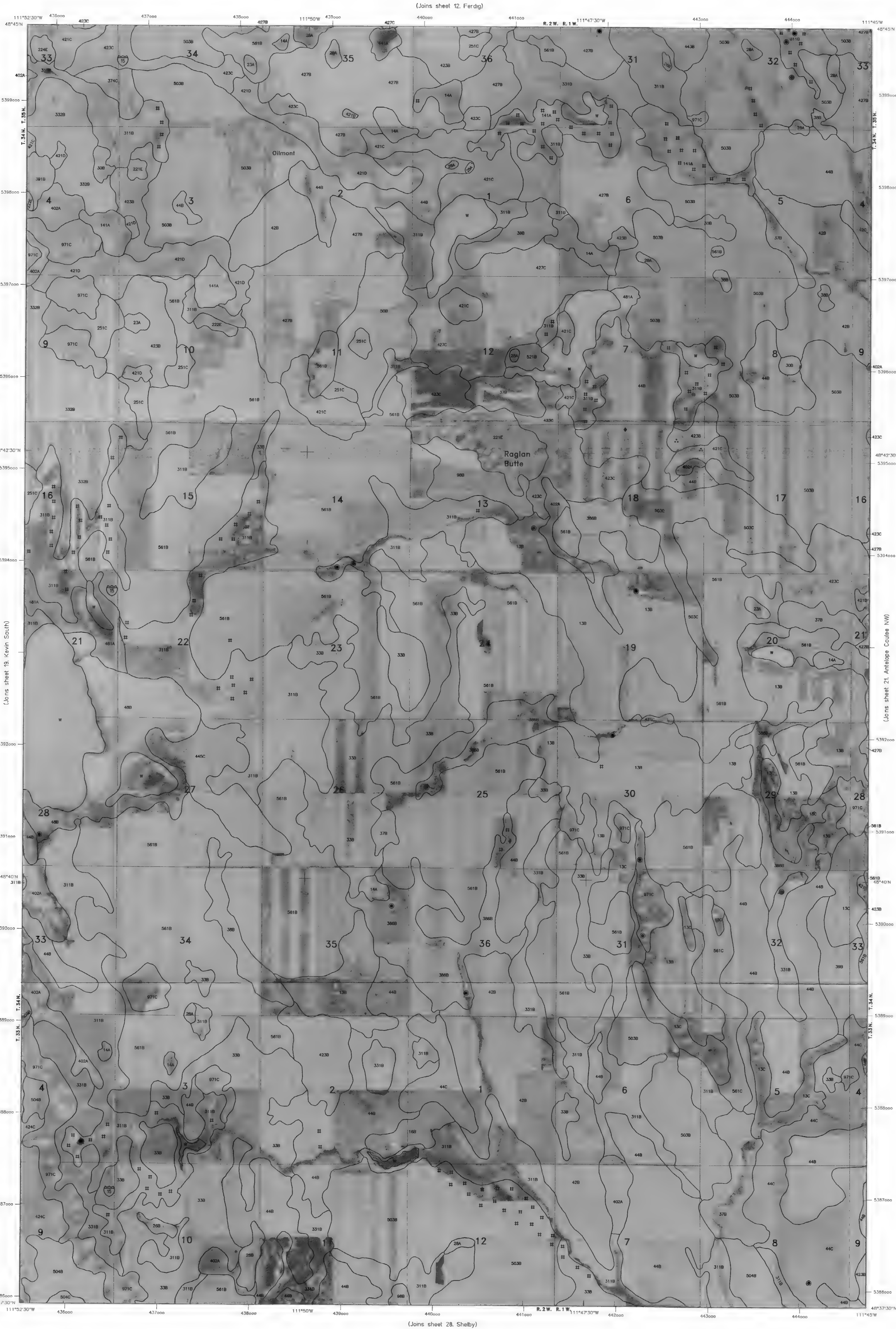


This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

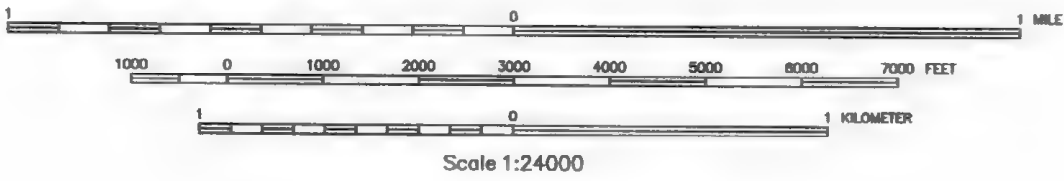


Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

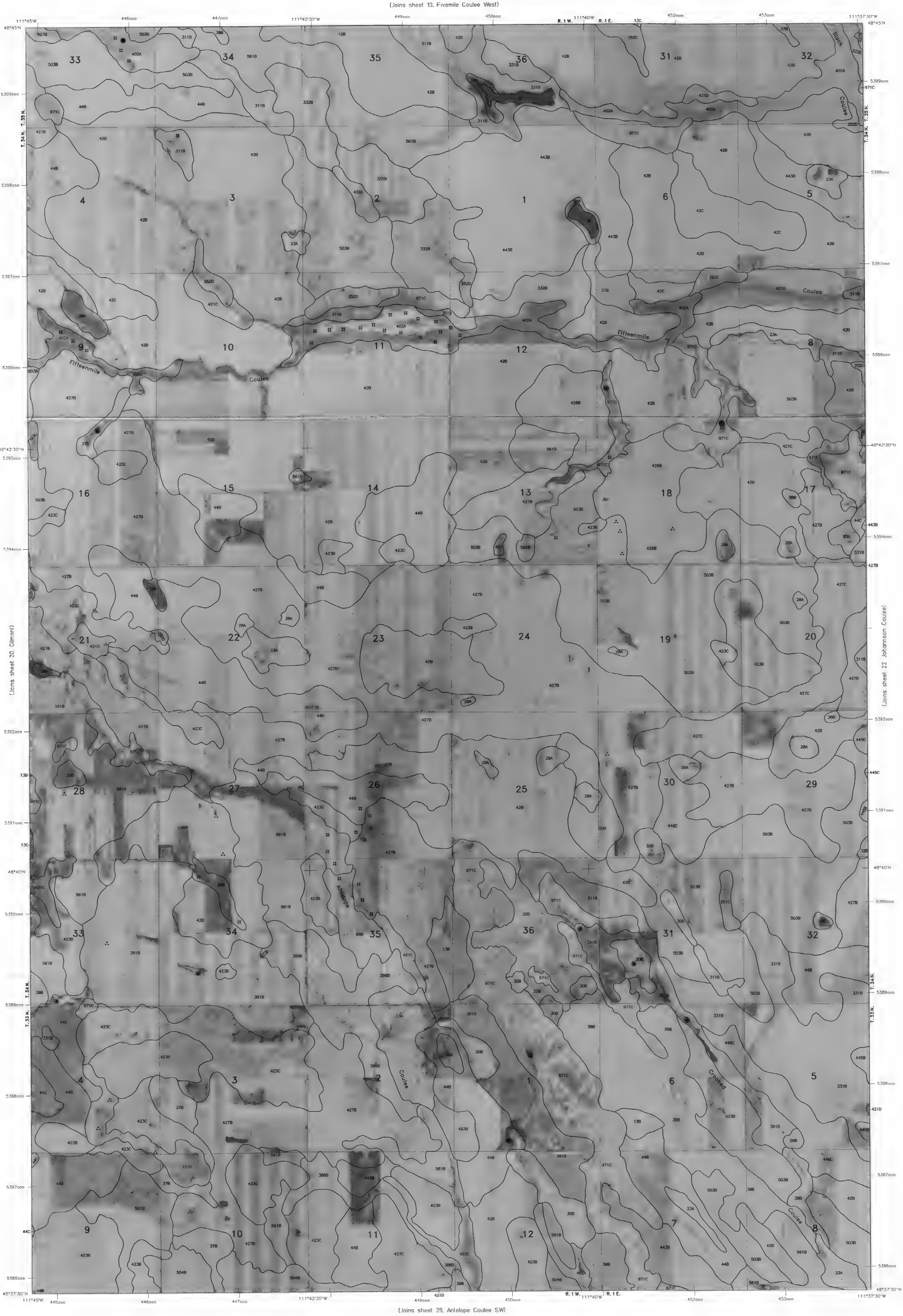


Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

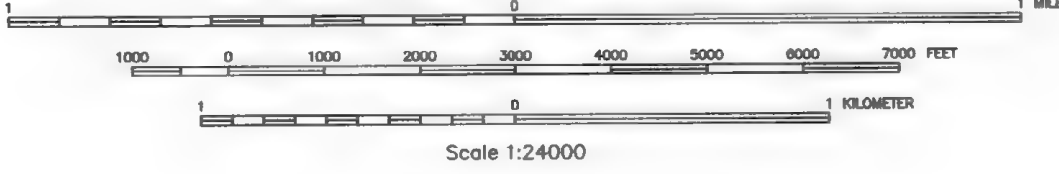
TOOLE COUNTY, MONTANA NO. 20

SHEET NUMBER 20 OF 49  
TOOLE COUNTY, MONTANA  
OILMONT QUADRANGLE





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976–1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum



(Joins sheet 14, Fivemile Coulee East)



(Joins sheet 30, Antelope Coulee SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

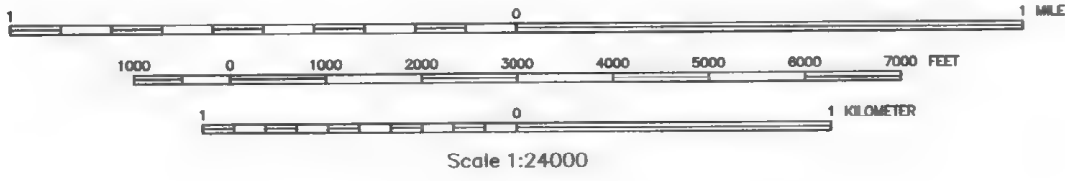
TOOLE COUNTY, MONTANA NO. 22

SHEET NUMBER 22 OF 49  
TOOLE COUNTY, MONTANA  
JOHANNSON COULEE QUADRANGLE





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 23

SHEET NUMBER 23 OF 49  
TOOLE COUNTY, MONTANA  
HAWTHORNE SCHOOL QUADRANGLE

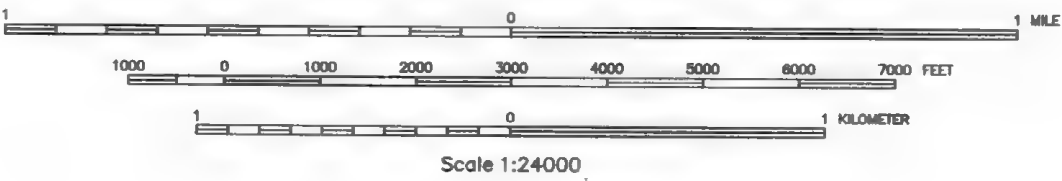


(Joins sheet 16, Grassy Butte)



(Joins sheet 32, McCarters Lake SE)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

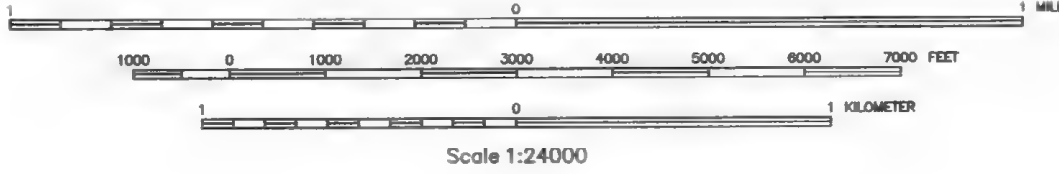
TOOLE COUNTY, MONTANA NO. 24

SHEET NUMBER 24 OF 49  
TOOLE COUNTY, MONTANA  
BERKHOLDER RESERVOIR QUADRANGLE





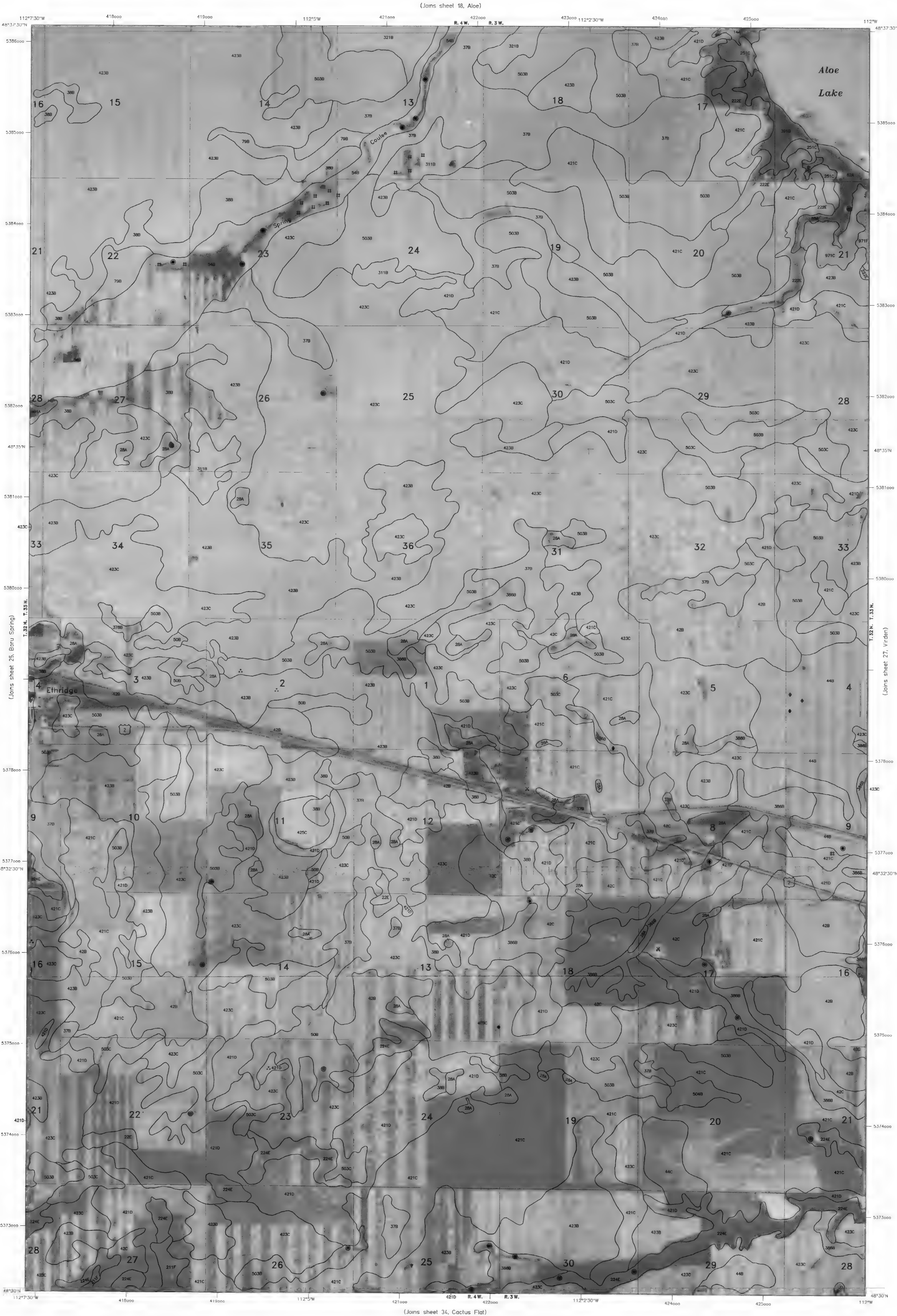
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



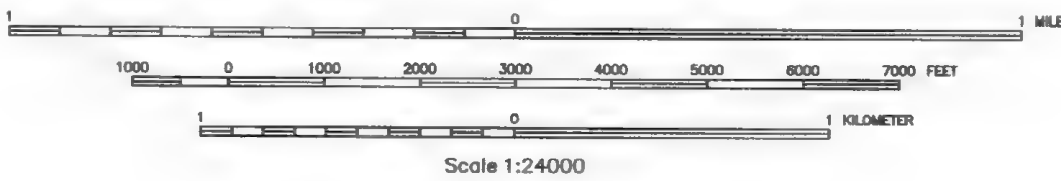
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum







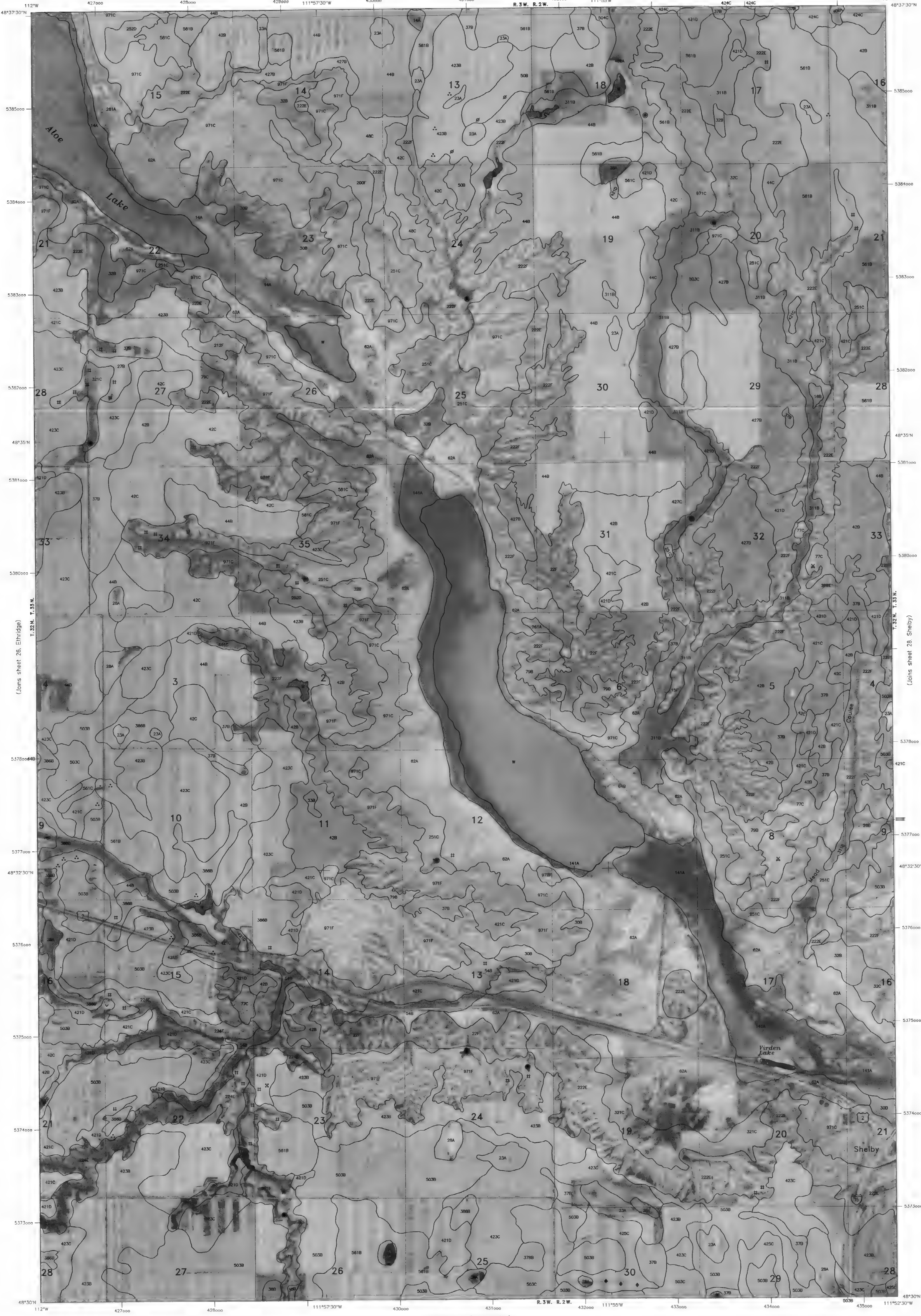
This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



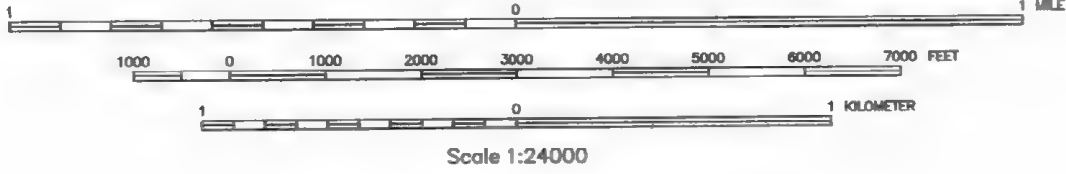
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum



(Joins sheet 19, Kevin South)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

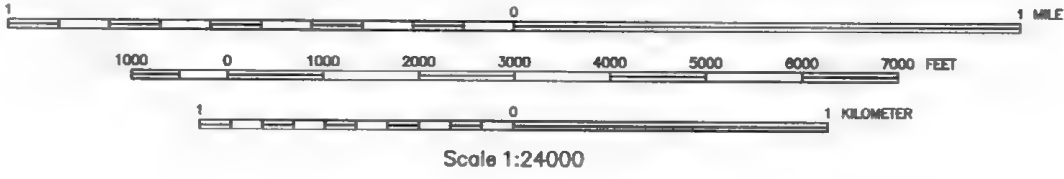
TOOLE COUNTY, MONTANA NO. 27

SHEET NUMBER 27 OF 49  
TOOLE COUNTY, MONTANA  
VIRIDEN QUADRANGLE





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 28

SHEET NUMBER 28 OF 49  
TOOLE COUNTY, MONTANA  
SHELBY QUADRANGLE





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

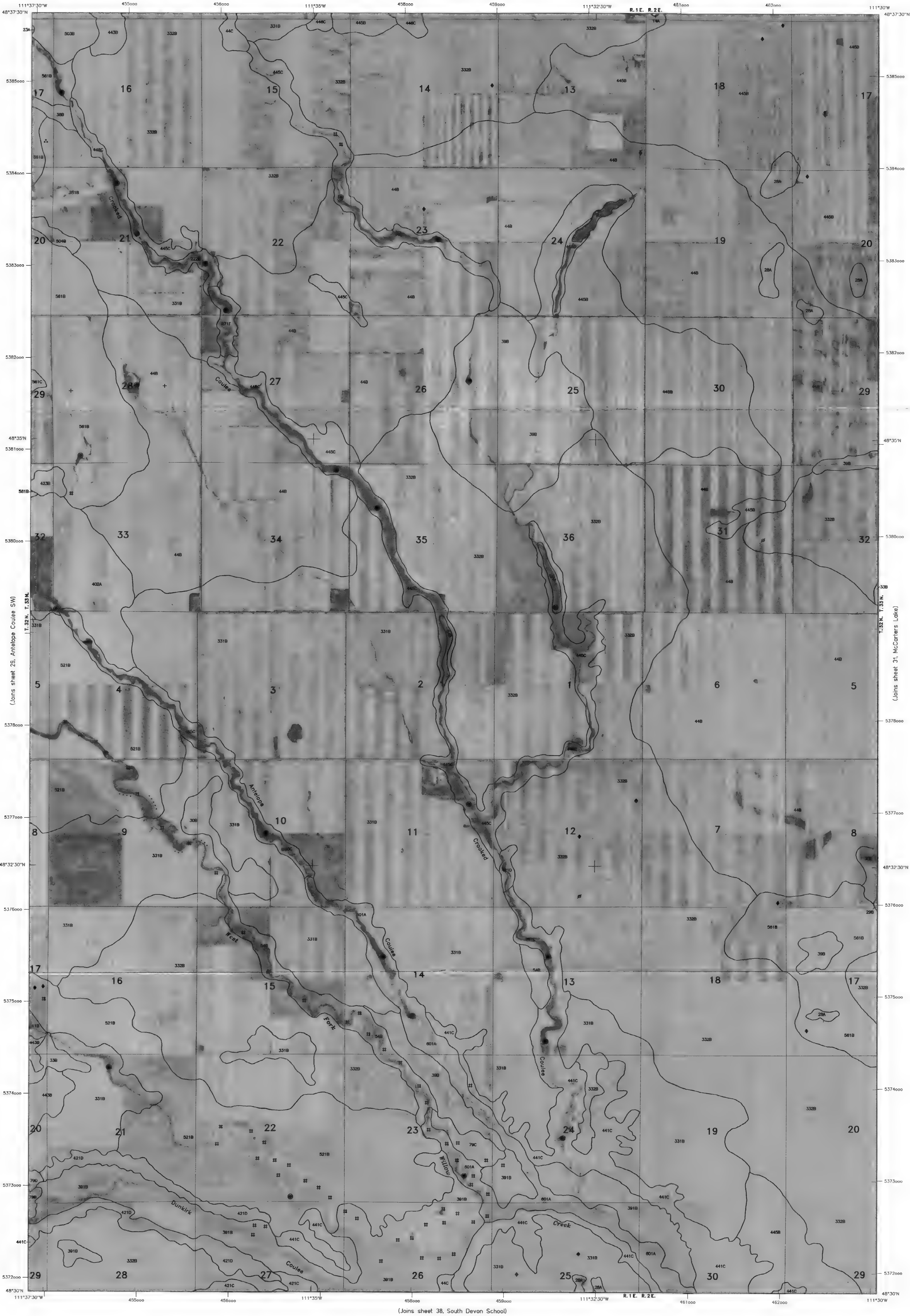
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 29

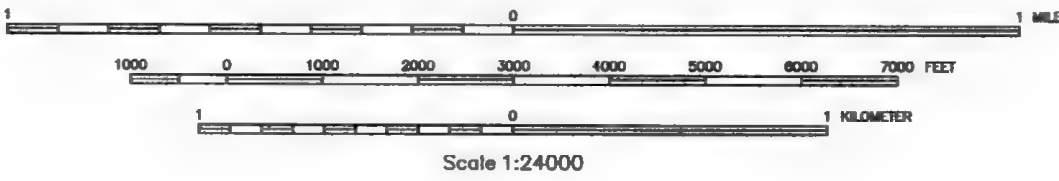
SHEET NUMBER 29 OF 49  
TOOLE COUNTY, MONTANA  
ANTELOPE COULEE SW QUADRANGLE



(Joins sheet 22, Johansson Coulee)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

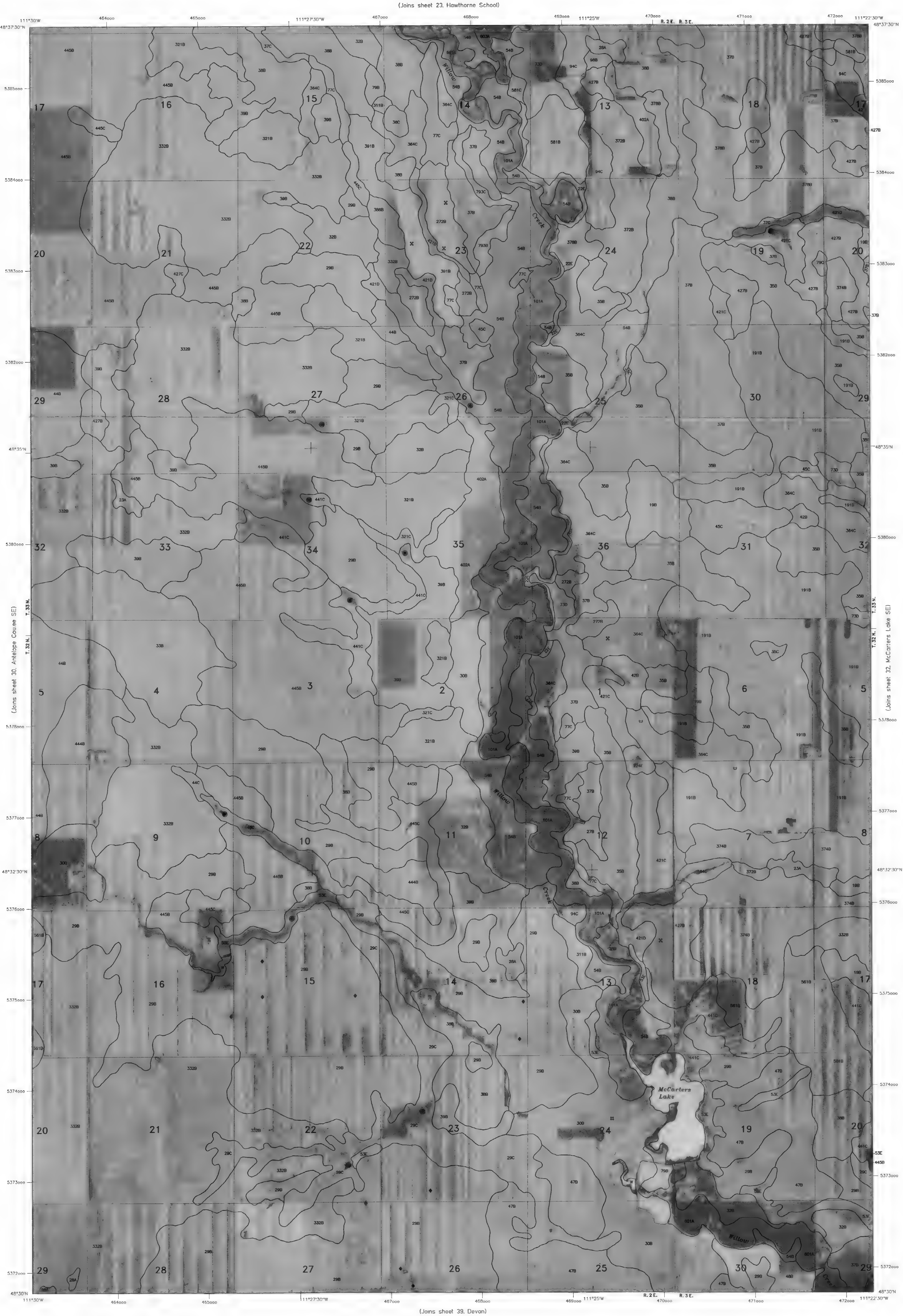


Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 30

SHEET NUMBER 30 OF 49  
TOOLE COUNTY, MONTANA  
ANTELOPE COULEE SE QUADRANGLE

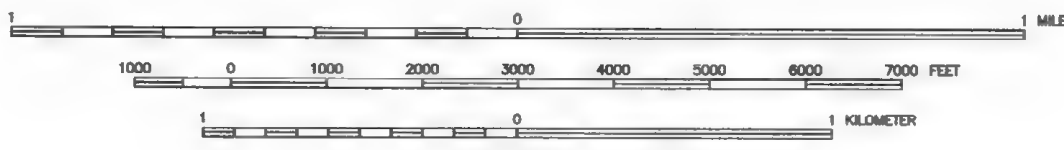




This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



(Joins sheet 24, Berkholder Reservoir)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

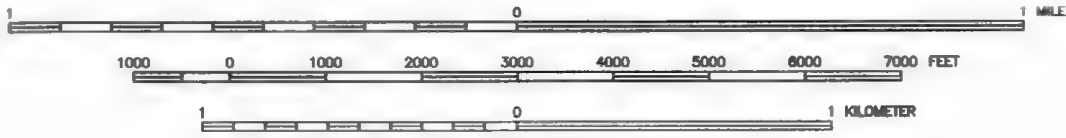
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 32

SHEET NUMBER 32 OF 49  
TOOLE COUNTY, MONTANA  
MCCARTERS LAKE SE QUADRANGLE



(Joins sheet 25, Boru Spring)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

SHEET NUMBER 33 OF 49  
TOOLE COUNTY, MONTANA  
ABBOTT LAKE QUADRANGLE



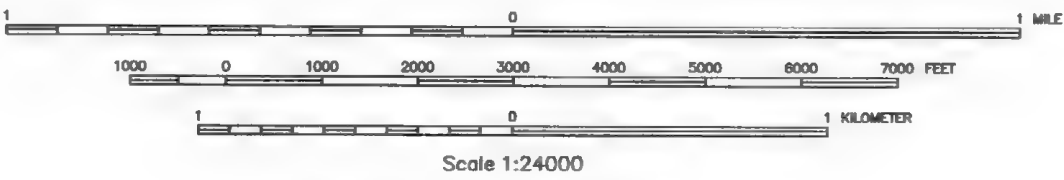
(Joins sheet 26, Elthridge)



(Joins sheet 33, Abbott Lake)

(Joins sheet 35, Ledger NW)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



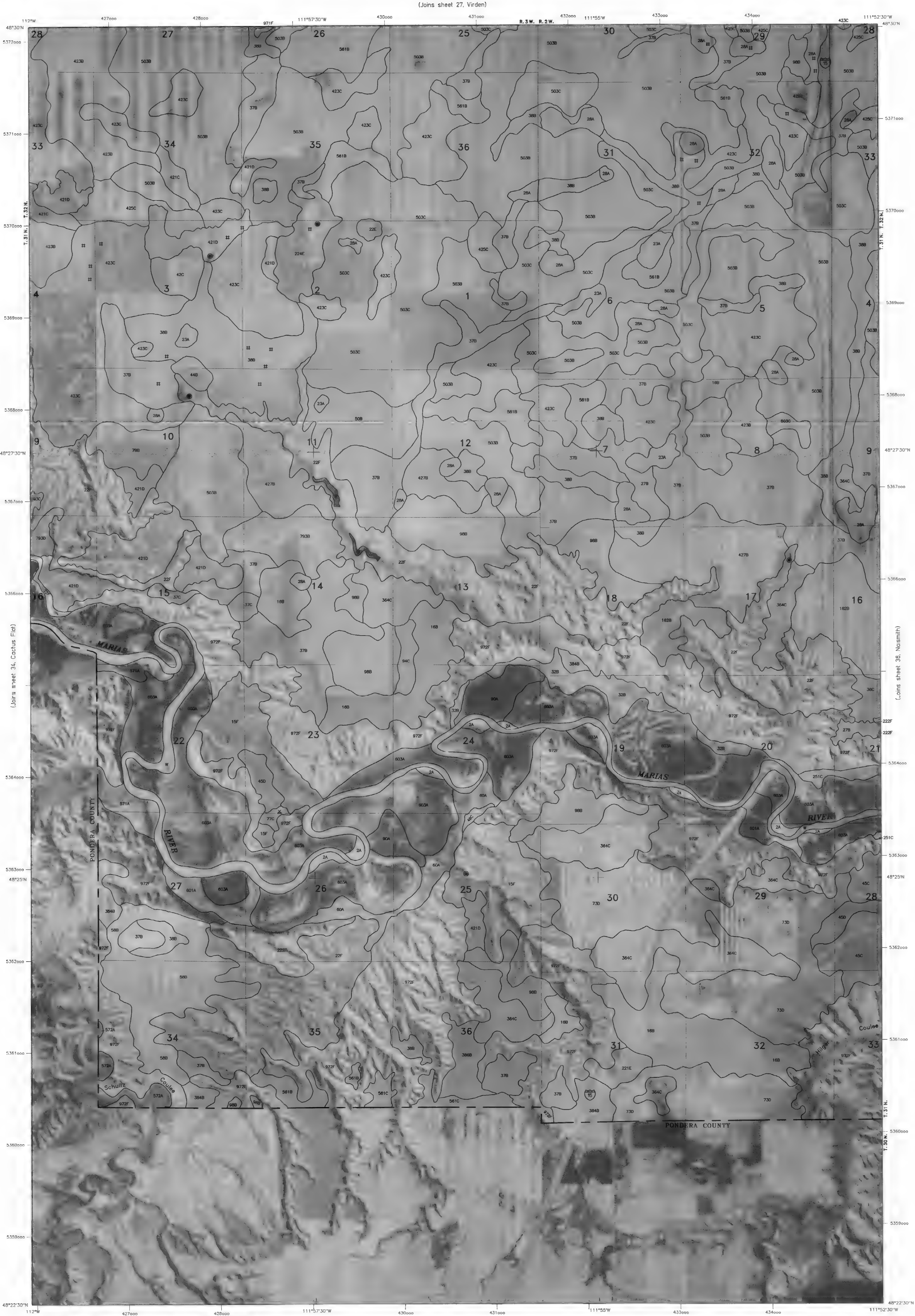
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 34

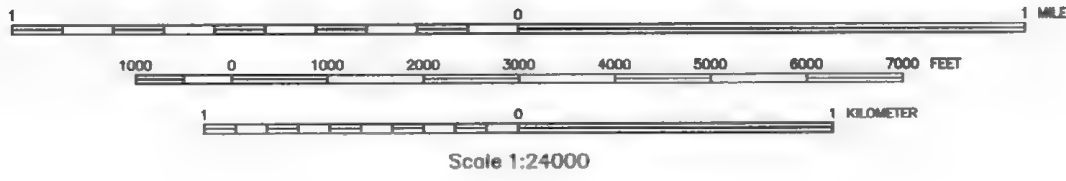


SHEET NUMBER 34 OF 49  
TOOLE COUNTY, MONTANA  
CACTUS FLAT QUADRANGLE





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum



(Joins sheet 28, Shelby)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 36

SHEET NUMBER 36 OF 49  
TOOLE COUNTY, MONTANA  
NAISMITH QUADRANGLE



(Joins sheet 29, Antelope Coulee SW)

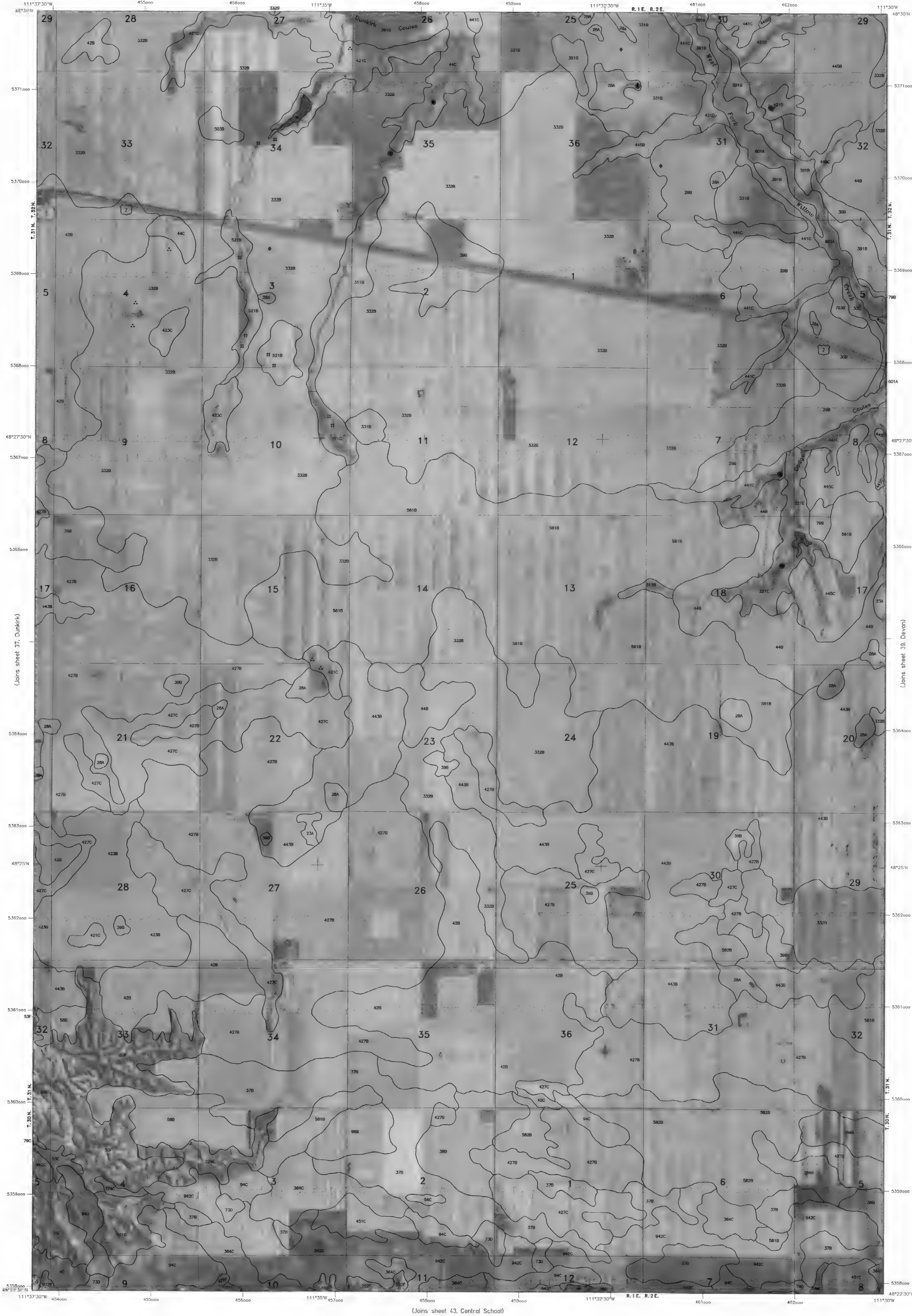


This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

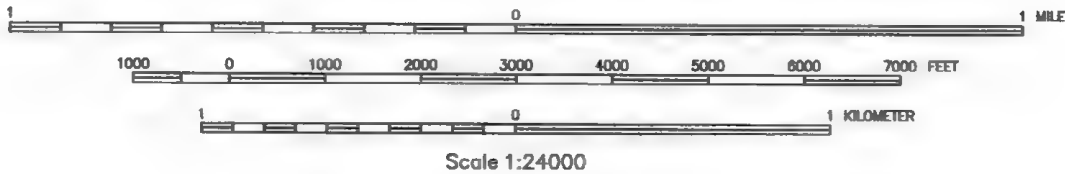


(Joins sheet 30, Antelope Coulee SE)



(Joins sheet 43, Central School)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



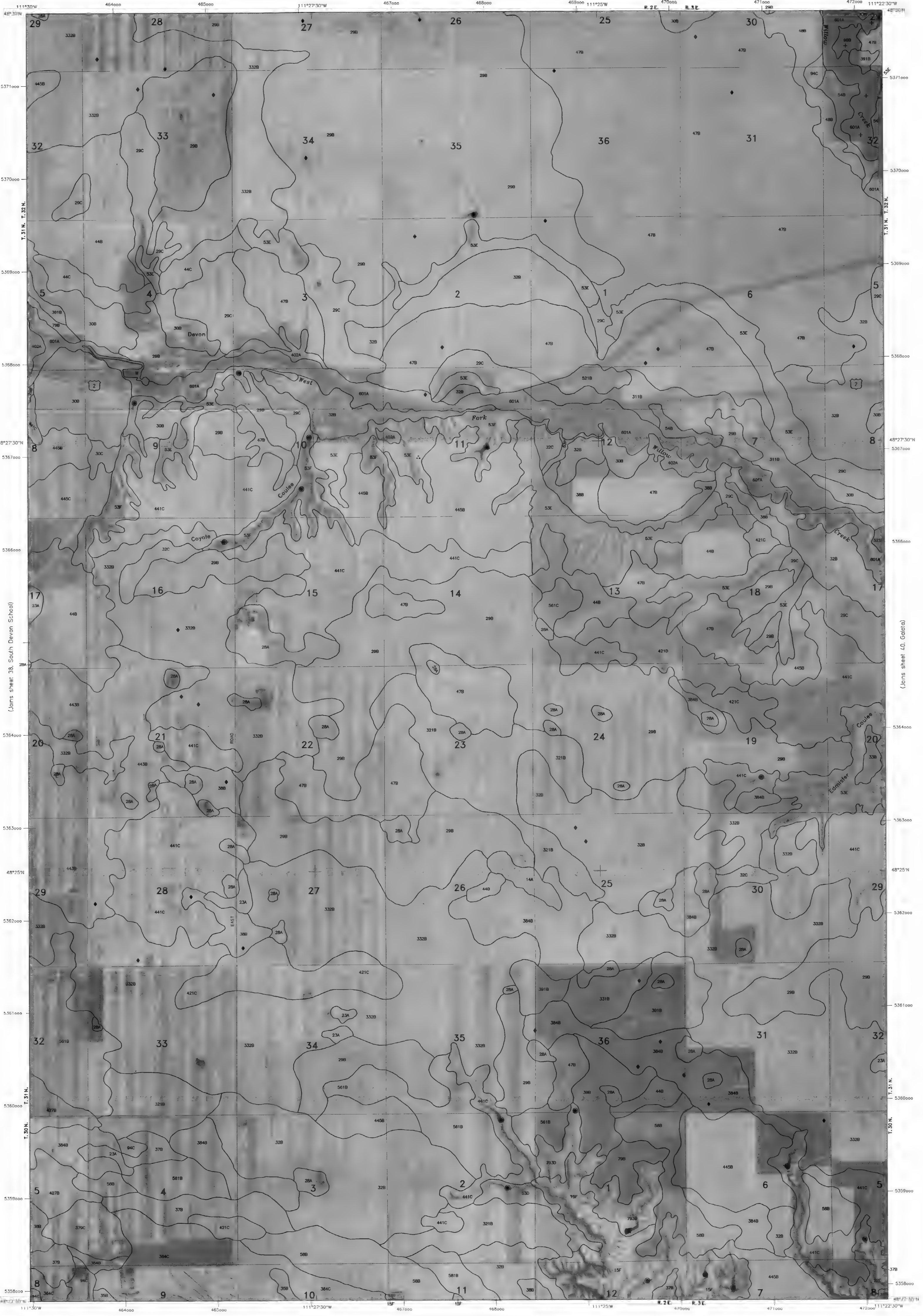
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 38

SHEET NUMBER 38 OF 49  
TOOLE COUNTY, MONTANA  
SOUTH DEVON SCHOOL QUADRANGLE

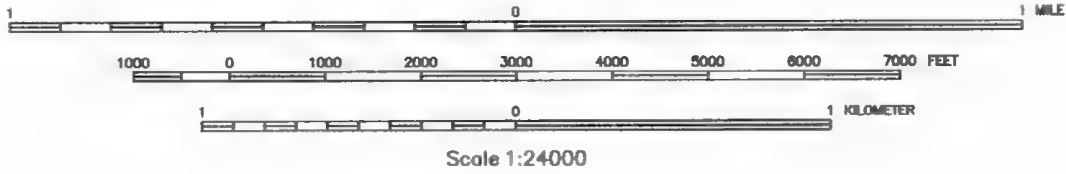


(Joins sheet 31, McCarters Lake)



(Joins sheet 44, Denson Ranch)

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



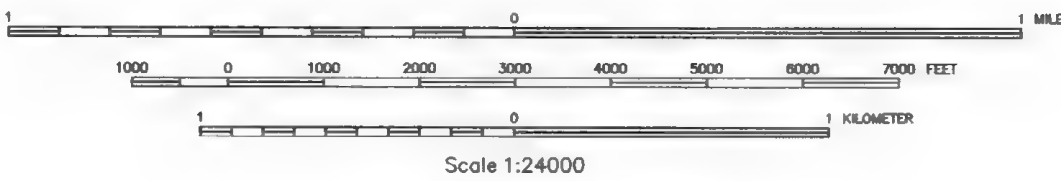
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum



(Joins sheet 32, McCarters Lake SE)



(Joins sheet 45, Pondera School)



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

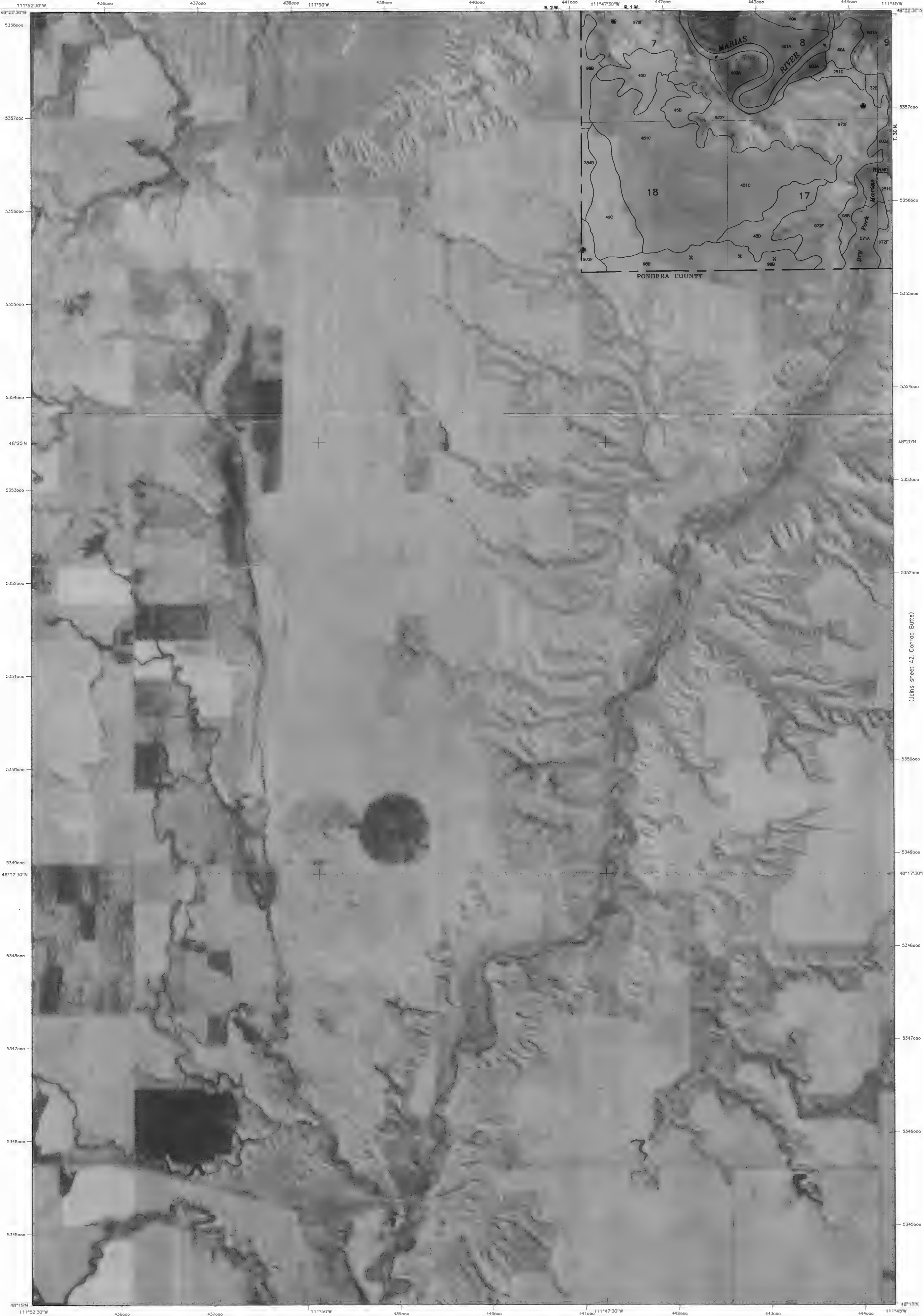
TOOLE COUNTY, MONTANA NO. 40

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

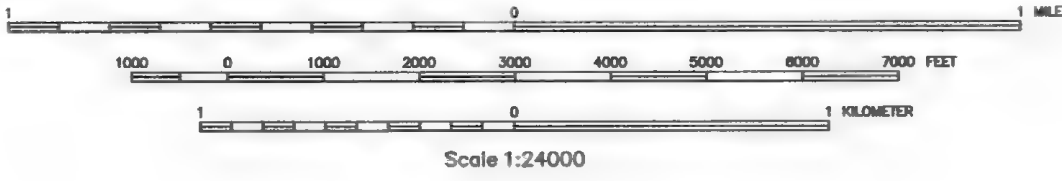
SHEET NUMBER 40 OF 49  
TOOLE COUNTY, MONTANA  
GALATA QUADRANGLE



(Joins sheet 36, Nasmith)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976–1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 41

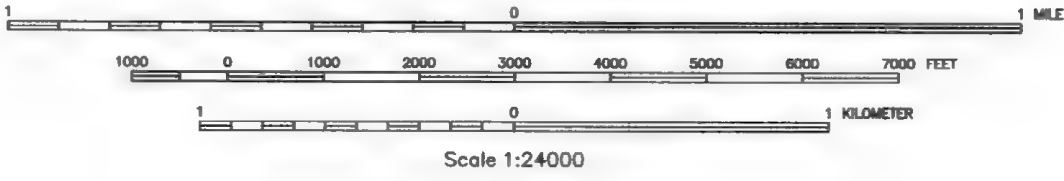
SHEET NUMBER 41 OF 49  
TOOLE COUNTY, MONTANA  
LEDGER QUADRANGLE



(Joins sheet 37, Dunkirk)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 42

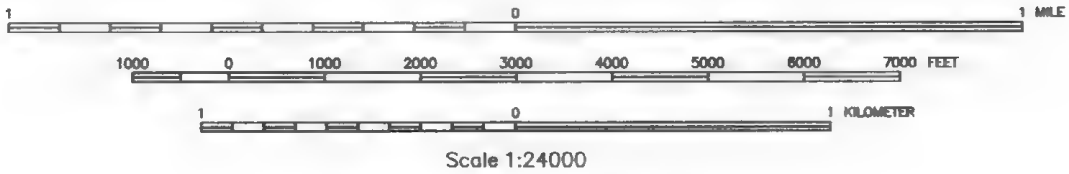
SHEET NUMBER 42 OF 49  
TOOLE COUNTY, MONTANA  
CONRAD BUTTE QUADRANGLE



(Joins sheet 38, South Devon School)



(Joins sheet 47, Fowler Coulee NE)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

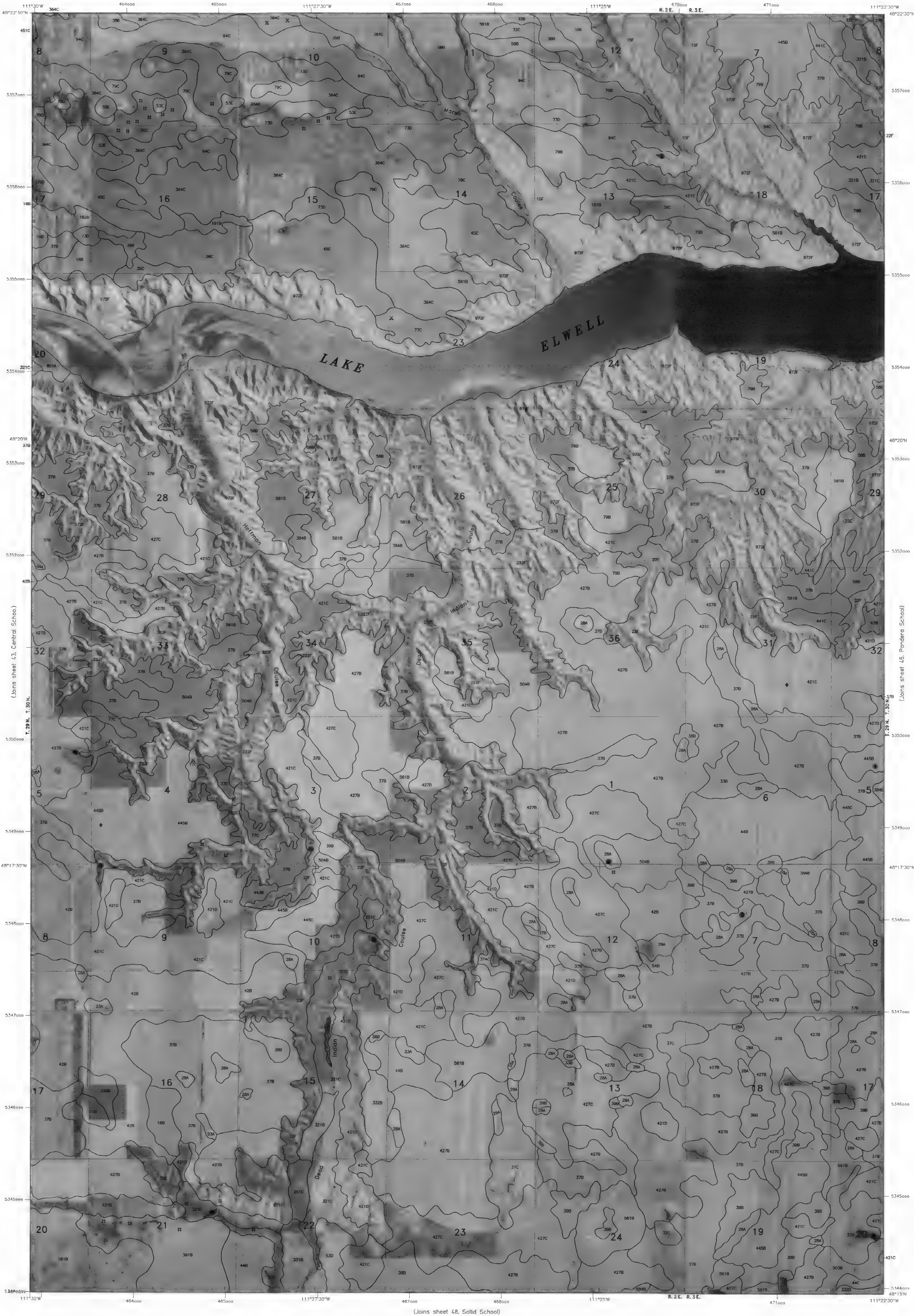
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 43

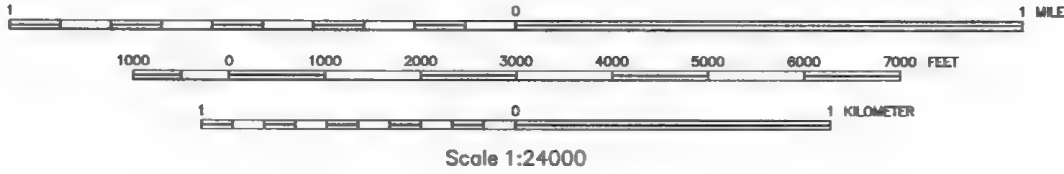
SHEET NUMBER 43 OF 49  
TOOLE COUNTY, MONTANA  
CENTRAL SCHOOL QUADRANGLE



(Joins sheet 39, Devon)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



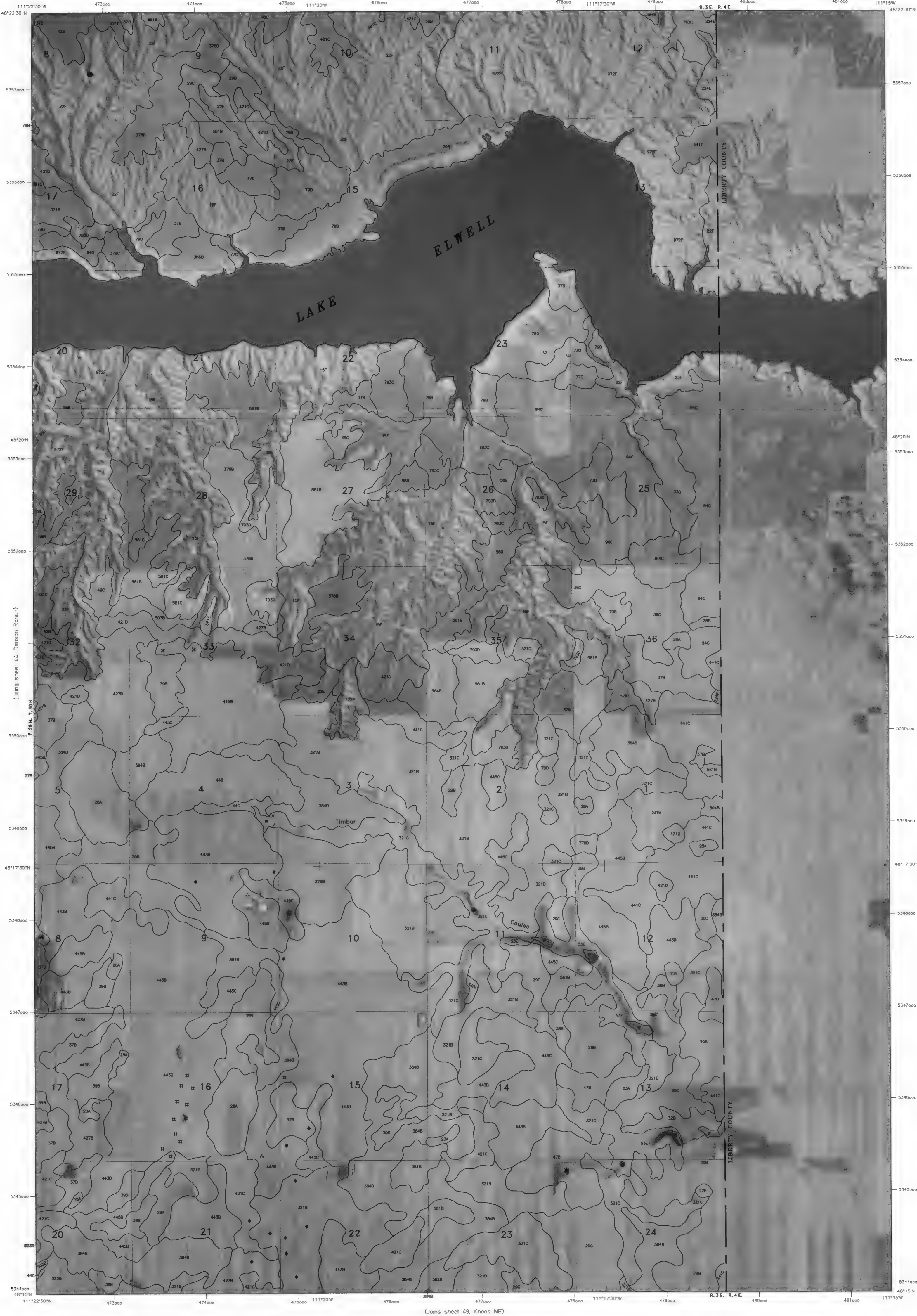
Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 44

SHEET NUMBER 44 OF 49  
TOOLE COUNTY, MONTANA  
DENSON RANCH QUADRANGLE



(Joins sheet 40, Galata)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976-1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 45

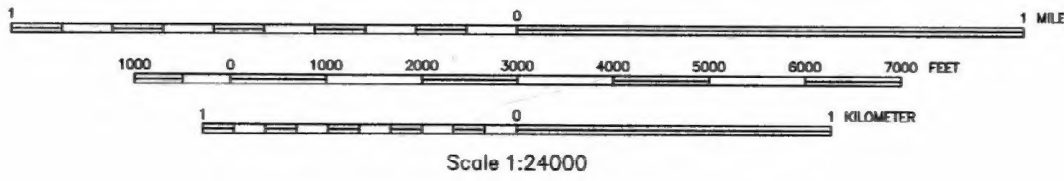
SHEET NUMBER 45 OF 49  
TOOLE COUNTY, MONTANA  
PONDERA SCHOOL QUADRANGLE



(Joins sheet 42, Conrad Butte)



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976–1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

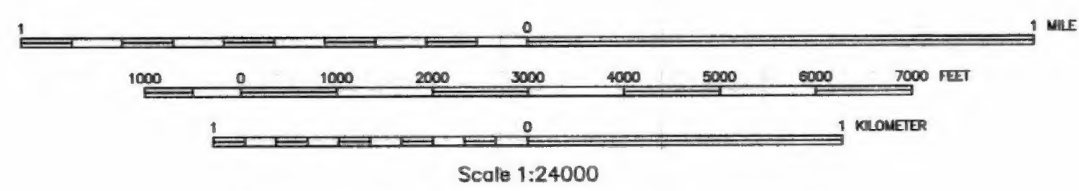
TOOLE COUNTY, MONTANA NO. 46

SHEET NUMBER 46 OF 49  
TOOLE COUNTY, MONTANA  
FOWLER COULEE NW QUADRANGLE



TOOLE COUNTY, MONTANA  
FOWLER COULEE NE QUADRANGLE  
SHEET NUMBER 47  
7.5 MINUTE SERIES

R. 1 E. R. 2 E.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

TOOLE COUNTY, MONTANA NO. 47



This map displays a geographical area in Montana, divided into two main sections: a topographic map at the top and an aerial photograph at the bottom. The topographic map shows contour lines, elevation points, and labels for 'Dead Indian Coulee'. The aerial photograph shows a large reservoir and surrounding agricultural fields. The map is divided into sections by a dashed line labeled 'PONDERA COUNTY' and 'LIBERTY COUNTY'. The map is framed by a grid with coordinates ranging from 46°15'N to 48°15'N and 111°20'W to 111°30'W.

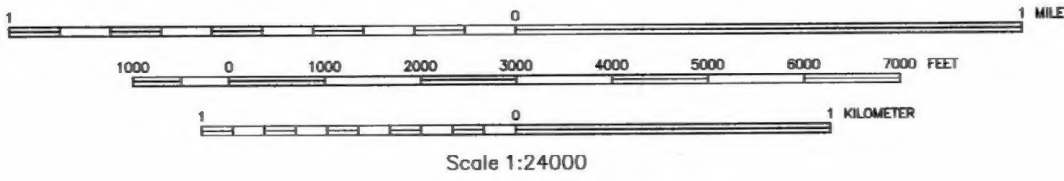


TOOLE COUNTY, MONTANA NO. 48





This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1976–1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.



Digital Data: UTM Coordinate System Zone: 12  
Polyconic Projection  
1927 North American Datum

